FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

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DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list—

1930	
July 20-Aug. 7	International Light 'Plane Tour of Europe, starting from Berlin.
July 26-27	Norwich Flying Meeting and Garden Party.
July 27-Aug. 3	London Gliding Club "Gliding Camp," Ivinghoe.
July 31	Entries close for 1931 Schneider Trophy Contest.
Aug. 9-24	Gliding Competitions, Rhön, Germany.
Aug. 15-31	Circuit of Italy.
Aug. 17	Shanklin Meeting.
Sept. 1-6	5th International Air Congress at The Hague.
Sept. 6	Opening of Ratcliffe Aerodrome, Leicester.
Sept. 6	Bristol and Wessex Ae.C. Air Display and Garden Party.
Sept. 20	Liverpool Air Pageant.
Sept. 27	N.F.S. Air Meeting, Hanworth.
Nov. 28-Dec. 14	Paris Aero Show.
1932	
May 31	Closing date for Cellon Cross-Channel Glide £1,000 Prize.

EDITORIAL COMMENT

"THE present situation of civil aviation, despite the progress achieved, is not as satisfactory as the state of technical development should permit." A ponderous and obvious truth is what one would have expected from a committee of the League of Nations, and the above quotation is the considered opinion of the committee of the League which deals with civil flying. We heartily wish that we could disagree with the committee, but it is impossible. There is no one in the world likely to quarrel with this dictum of the League, and that is more than can always be said.

The Use of Air Mails

Point is lent to this finding of the League's committee by the air mail statistics just published by our own Postmaster-General. During the June quarter of the current year 22,277 lb. of air mail were despatched from this country, which is an increase of 36 per cent. on the figure for the same quarter last year. All these letters did not travel all the way by air, and probably they did not all leave England by air. Letters are counted which on arrival at Perth and Cape Town were forwarded by air mail to other places in Australia and South Africa. It is rather curious that the air mail in South Africa was slightly more popular with correspondents in Great Britain than were the Australian air mails, the difference being about 100 lb.—say, 3,000 letters in the quarter. Still, the weight of air mails from Great Britain which left Perth jumped from 299 lb. in the June quarter of last year to 1,152 lb. this year, which shows that the Perth–Adelaide air service is increasing in popularity. Last year there was no air mail in South Africa; so Maj. Miller and Union Airways, Ltd., may be congratulated on having secured 1,269 lb. of mails from Great Britain in their first year of work.

The Indian service showed the greatest popularity and the greatest increase in its work. In the June quarter last year this service carried 10,064 lb.,

of which 4,937 lb. were for India itself, and this year it carried 12,162 lb., of which 8,506 lb. were for India. As this is the only through air service, it is natural that it should be the most popular. In contrast to this, the services which fly from England to the Continent only carried 5,002 lb. in last year's June quarter, and only increased to 6,501 lb. in the same quarter this year.

The all-round increase in the utility of our air mails is gratifying, but the figures confirm the finding of the League's committee. The state of civil flying is not as satisfactory as it should be. The Postmaster-General's statistics suggest some reflections on British air policy. We started with cross-Channel services in 1919, and after 11 years these services only carry 6,500 lb. of mail in the busiest time of the year. The airways in Australia are now carrying some 4,000 lb. of mail every quarter, though they serve a population smaller than that of London. Obviously, from the point of view of attracting business, our start was a mistake, while that of Australia has been amply justified. Our latest venture has been the airway to India. That has jumped into an immediate degree of popularity which surpasses all other air services from Great Britain. It is not yet as popular as it ought to be, because Karachi is in a corner of India far distant from the chief commercial centres. Railway communications with Karachi are poor, and as yet there is no distribution by air to the commercial centres. Still, the comparative popularity of a long-distance air mail in a very short period is a striking fact.

It should be noted that of all the major countries of the British Empire there are only three in which internal air mails are non-existent, or almost non-existent: these are Great Britain, New Zealand, and India. One is inclined to wonder whether it was bad policy which led us to direct our first Empire airway to India, where there is no organisation for the rapid distribution of the letters. The fact that already the internal services of South Africa and Australia are patronised by correspondents in Great Britain suggests that much better immediate results would have been obtained if we had first flown direct to Cape Town instead of to Karachi. The reply is that last year there were no internal air services in either South Africa or India. Both were on the point of starting them, and by next year India should be further developed than South Africa will then be. One must always take the long view, and seek for justification in the reverse of the proverbial "small profits and quick returns." Moreover, India is not only capable of great development herself, but is also a stepping stone on the way to Australia. When—and before long, we hope—our eastern airway reaches Australia, it will not only be the longest airway in the world, and it will not only show the greatest saving in time, but it will reach the part of the Empire which is most completely organised to deal with the distribution of the mails.

The moral of the Postmaster-General's figures is that the least useful of British air efforts are the cross-Channel services, and that even a long airway is only of partial use until internal distribution is organized. Karachi is to India much what Croydon is to London. Each is the most suitable site for an airport, but a speeding-up of the time spent between the airport and the chief centres is of vital importance. An airway is of very little use when in competition over short distances with a railway. The success of all the Australian airways, except one (namely that from Adelaide to Melbourne and Cootamundra) is largely due to the selection of routes where railways did not compete. According to some figures of the League of Nations Transit and Communications Section (which we publish in full elsewhere, and for which we are indebted to the Geneva correspondent of the *Manchester Guardian*), the airway company which pays best is the Scadta, or Colombian-German air transport company, which can cover in eight hours a distance which otherwise takes eight days; while the soundest company in Europe, from the economic point of view is the K.L.M. In this connection, it is instructive to note that on the kilometre-ton basis the K.L.M. receives three francs subsidy, United States lines about 11 francs, Italian lines 12 francs, German lines 14 francs, French lines 17 francs, and British lines about 20 francs on European airways, and 90 to 100 francs on Empire airways. Incidentally, the same authority states that, taking statistics for five years, one passenger is killed for every 2,551,035 miles flown in Germany, one for every 2,441,405 miles in the United States, and one for every 2,331,815 miles on Great Britain's lines. It is surprising to find Great Britain taking only third place in the list of safety, but had Dominion air lines been included, the figure might have been better. In any case, one fatality for 2⅓ million miles is a figure which should reassure the most nervous traveller.

In regularity of service, the British lines stand first, with a figure of 92 per cent., the American figure being 89 and the German figure 90. It is gratifying to lead in this respect, but no other form of mail transport would consider a regularity of 92 per cent. sufficiently good. Again, the Dominion figures would certainly raise the British average.

Another question arises. Have we been wise to dissipate our effort by catering at one and the same time for two very different classes of cargo, namely, passengers and mail? The requirements of the two are very dissimilar. In the early stages of air transport, mails must be more important than passengers. The United States was the one country which realised this, and its Post Office started an East-West air mail, and saw it through its early vicissitudes before permitting passengers to be carried. A mail aeroplane should be especially designed for its task, and it should have a much higher cruising speed than is possible for any passenger machine. If the Vickers Viastra machines ordered by West Australian Airways, Ltd., can cruise at 140 m.p.h., it would be very moderate to demand 150 m.p.h. from a special mail aeroplane. To rush the mails across the Empire at that speed, and to push on as fast as possible with night-flying would be to confer a real boon on the British business world. To confer a substantial boon is the best form of advertising. Then aircraft helps itself by helping others. Subsidies are barely justifiable when they are granted merely to keep aircraft in the air. They are then like brandy to a moribund patient. The are amply justified when the air line which they support proves of real benefit to a community. It is this quality of service which makes the lines in West Australia, Queensland, North-West Canada, and Columbia so outstanding. Nevertheless, we hope that with the coming extensions of our airways to Capetown and Calcutta, the volume of mail carried a year or two hence will make the present figures look very paltry.



THE SHORT "VALETTA": Approximately of the same weight and carrying capacity as the "Calcutta," this machine is an interesting experiment to determine the relative merits of twin-float monoplane and ordinary flying-boat. (See pp. 826-830).

THE SHORT "VALETTA"

A New 3-Engined Twin-Float Monoplane

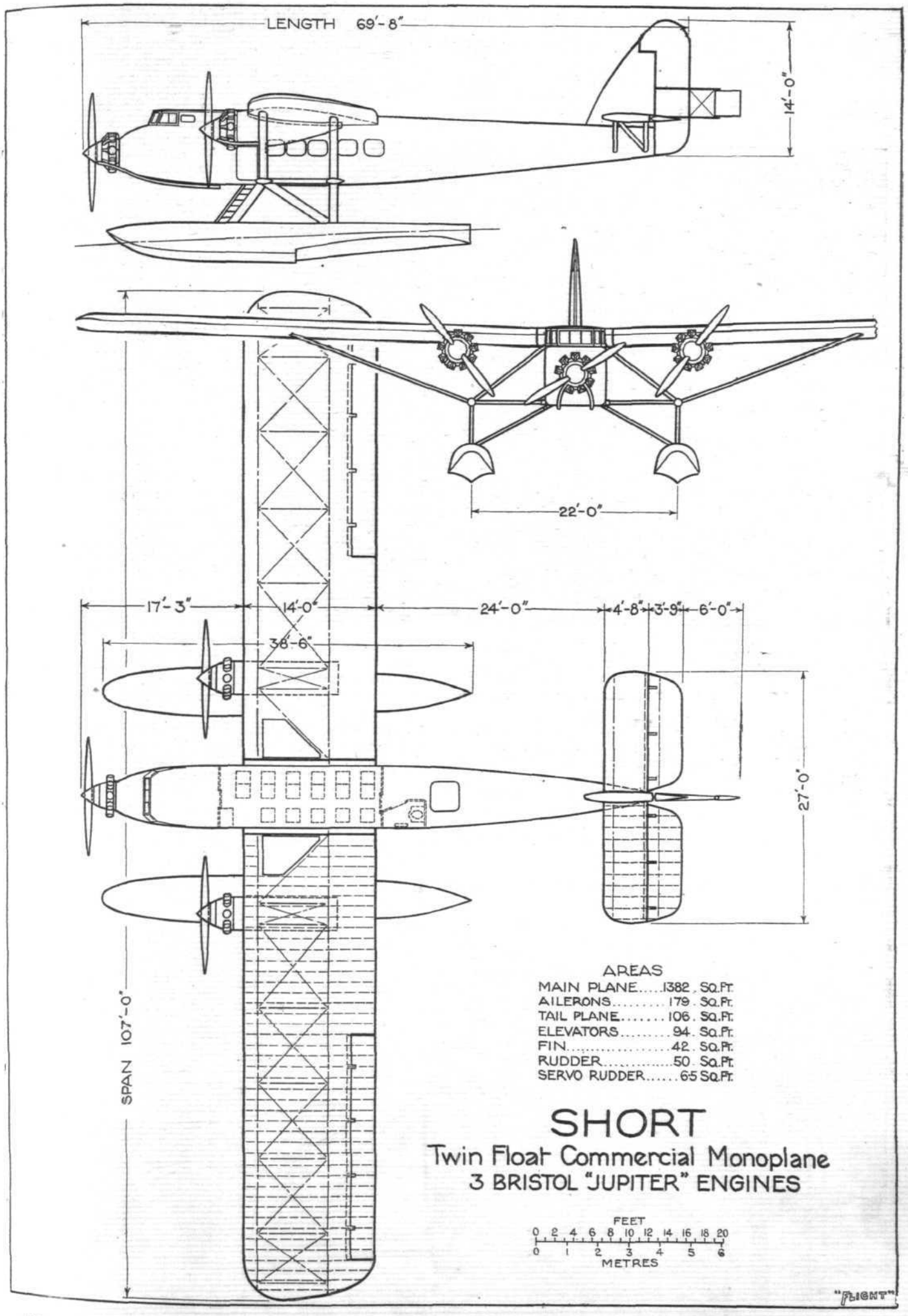


THE SHORT "VALETTA": View inside the Cabin, looking aft. Note that the windows are set low, so that passengers can look down without craning.

SEAPLANE versus Flying Boat is a subject which appears still to be as open to discussion as is the even older problem: Monoplane or Biplane? And at the present moment no one can say quite definitely what is the answer to either. Great Britain has, by following a programme of intensive development during recent years, established a lead in the matter of flying-boats which it will take foreign nations some time to overtake. We are referring now to flying-boats that are really seaworthy in the sense in which we use the expression in this country. We do not think anyone will seriously challenge that statement. Other nations may have produced *larger* flying-boats; but that they have produced more seaworthy flying-boats we doubt. Put in another way, we believe most people who have studied the subject at all carefully will admit that our relatively small flying-boats possess more real seaworthiness than some very much larger boats that have been turned out elsewhere. From that one might, perhaps, argue that if British constructors were given orders for much larger flying-boats than hitherto, they could legitimately be expected to produce something having real seaworthiness—something that would live in almost any sea. That is likely to be proved or disproved in the not too distant future. However, that is a subject which does not concern us here.

In view of the acknowledged superiority of British over foreign flying-boats, it may seem somewhat surprising that a firm which has established a world-wide reputation for their flying-boat products—Short Brothers of Rochester, to wit—should have turned aside for a moment from the development of a type with which great success has been achieved to explore the possibilities of a very different type of machine. In reality, it was very natural that Short Brothers should do so. Mr. Oswald Short has, ever since he and his brothers began aircraft work in the earliest days of flying, been in the habit of looking far ahead. While busy on turning out types which have attained success, he is known by those who know him best to be always wondering whether even greater success might not be the reward for striking out along new lines. The firm of Short Brothers have done a vast amount of experimental work during the last five or six years, and the reward for that expensive work is now materialising in the form of substantial orders, manufacture under licence abroad, and so forth. But it is not in the nature of Mr. Short to sit down and take it easy on the results already achieved. He is a deep thinker and something of a visionary; but his success hitherto is ample proof that he is very far from being an idle dreamer. Some of the novel projects have not been an unqualified success, but out of the many experiments made there have been surprisingly few failures. And the experience gained, even by those experiments which were least successful, must be of inestimable value to the firm.

It is now a good many years ago that Mr. Short happened to mention to us, during a conversation, that he was by no means convinced yet that the large twin-float seaplane might not, for certain work, offer a better solution than the single-hull flying-boat. At the time we do not think Mr. Short had any definite idea that he was likely, in the near future, to be in a position to test out his theories on a really large machine; but that opportunity has now presented itself,



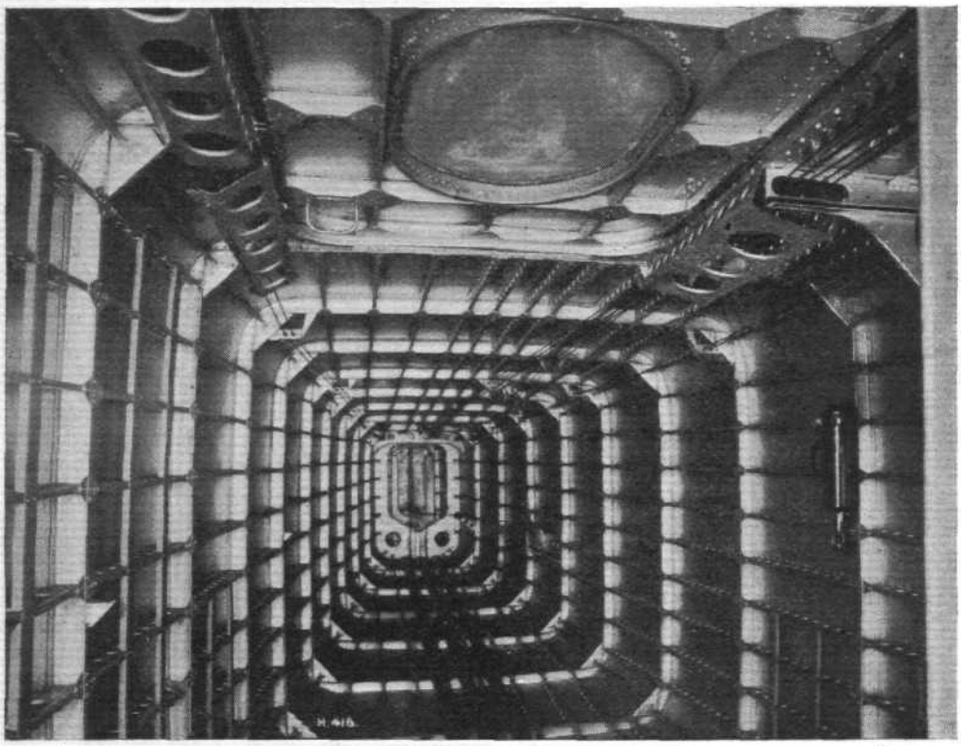
THE SHORT "VALETTA": General arrangement drawings. A wheel undercarriage is also provided.

and the result is the "Valetta" monoplane which forms the subject for these notes.

Built to the order of the Air Ministry as an experimental aircraft with a view to testing the relative merits of the twin-float seaplane and the flying-boat, the "Valetta" differs in more than its flotation members from the usual British flying-boat. She is, in addition, a monoplane of all-metal construction, and equipped with a power plant comprising three Bristol "Jupiter" XI F geared engines. In other words, the "Valetta" represents a radical departure from what has become orthodox British practice. From the fact that the new machine is of approximately the same gross weight as the "Calcutta," it should be relatively easy to obtain an illuminating comparison between the two, and to throw light on the question: Seaplane or Flying Boat?

A fairly detailed description appeared, exclusively, in FLIGHT of August 22 last year, and now that the machine has been finished and flown, there are a certain number of changes to be noted, mainly in weights, as compared with figures given by us nearly a year ago.

The general lay-out of the "Valetta" is well shown in the general arrangement drawings on p. 827, from which it will be seen that the machine is a high-wing monoplane in which the wing bracing is arranged in a somewhat unusual manner. Outriggers springing from the top and bottom longerons of the fuselage meet outboard in a point, and to this point are attached the wing-bracing struts and the float struts of the undercarriage. The whole forms a series of triangulated bays, statically stable and capable of transmitting loads in two directions. The two wing engines, it will be seen, are supported on the wing spars only, *i.e.*, there is no strutting to the outriggers. The floats are very widely spaced, and lateral stability on the water should be very good, although when running diagonally in a considerable seaway the wide spacing of the floats might conceivably tend to swing the machine off its course.

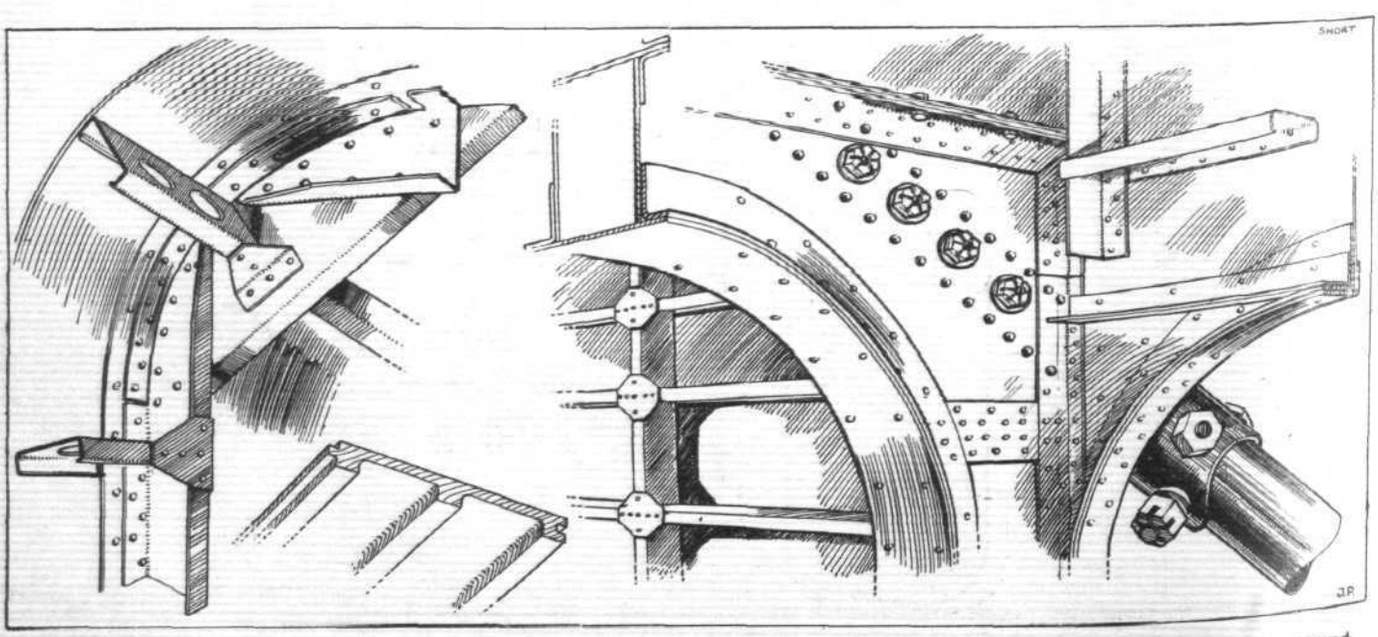


IN THE LUGGAGE HOLD: This view, looking towards the stern, shows clearly the absence of obstructions inside the hull. The hull frames are not cut into, while the fore-and-aft stringers are interrupted at the frames and secured to them by gusset plates.

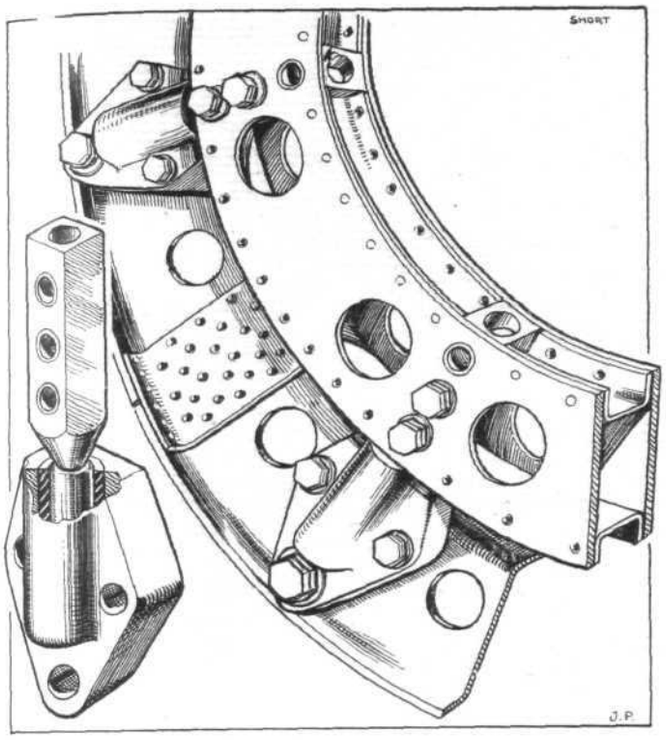
The fuselage, although actually of large dimensions and giving full head-room, looks small in proportion to the large wing, and interference drag should not be excessive. That the minimum drag coefficient of the machine must be fairly small is shown by the fact that the top speed attained, *i.e.*, 135 m.p.h., corresponds, for the wing and power loading of the machine, to an Everling "high-speed figure" of 16, which must be regarded as high for a three-engined machine and especially in view of the fact that the machine is a seaplane.

In structural design the "Valetta" follows fairly closely the "Calcutta." The fact that the former is a monoplane and has a fuselage has necessarily meant changes in dimensions, but no very great changes in the constructional methods employed. The monoplane wing is of the normal two-spar type, the spars being of the usual Short construction, with flanges and webs of Duralumin, corrugated for stiffness, and the flanges laminated to approach as closely as possible to uniform strength throughout. The ribs are girders of Duralumin tube.

The fuselage construction of the "Valetta" resembles that of the hull in the "Calcutta." That is to say, the



THE SHORT "VALETTA": Details of the fuselage construction are shown on the left. Specially strong frames are used where the main wing spars join the body, as shown on the right. (FLIGHT *Sketches.*)



FLEXIBLY MOUNTED ENGINES : Rubber is interposed between the engine bearers and their support on the aircraft structure in order to reduce the amount of vibration transmitted to the cabin, &c. (FLIGHT *Sketches.*)

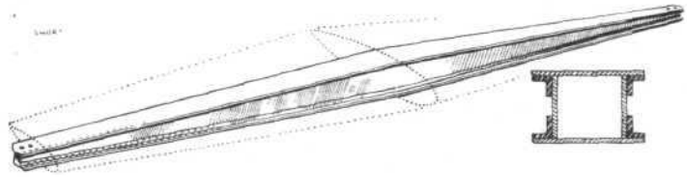
transverse members or frames are continuous, while the fore-and-aft stringers are interrupted at the frames and secured to them by gusset plates. The planking, of sheet Duralumin, is riveted to frames and stringers, as in the boat hulls.

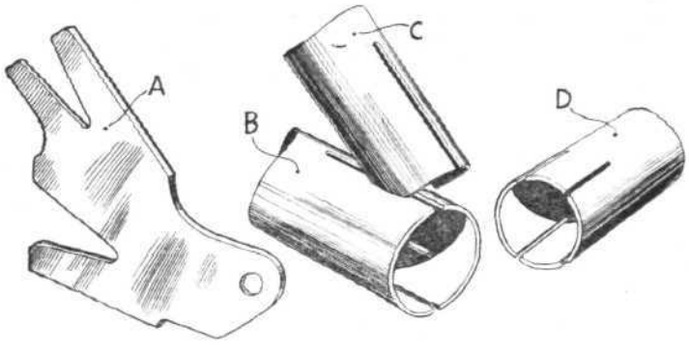
The power plant of the " Valetta " consists of three of the new Jupiter series XI F engines, one of which type has, as recorded elsewhere in this issue, recently passed a very strenuous type test. One engine is mounted in the nose of the fuselage and the other two in streamline nacelles under the wing. In order to reduce the amount of vibration transmitted from the engines to the aircraft structure, a novel form of shock-absorbing or vibration-damper arrangement has been evolved. This consists in interposing between the engine plates and the supporting structure a series of rubber pads, as shown in one of our sketches. The engines are, in fact, " floating on rubber," and the reduction in vibration which can be noticed in the cabin is very considerable. The petrol tanks are housed in the wing, and give direct gravity feed to all three engines.

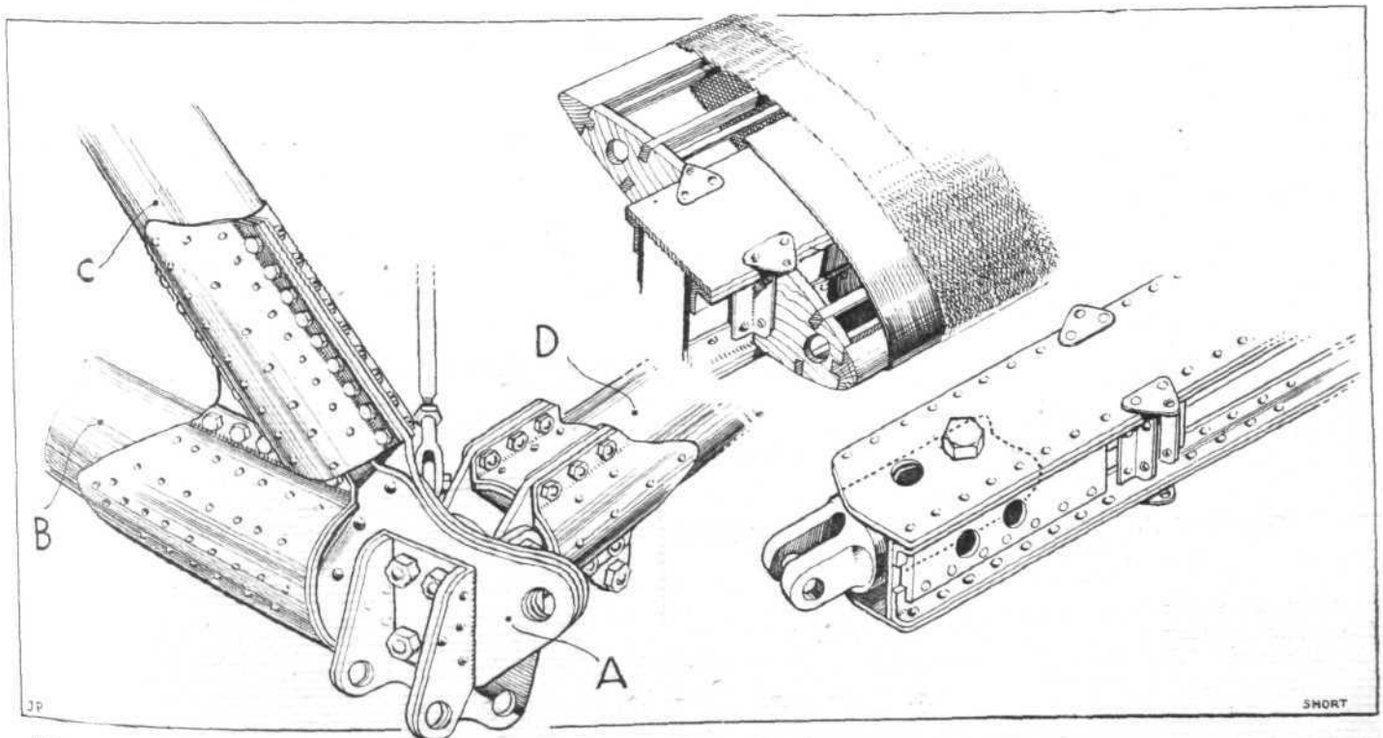
Engine starting is by means of a Bristol gas-turbine, mounted on top of the fuselage, and when the machine is in the air and the main engines not running, this engine is available for driving the general-purpose generator for lighting and other services. Hand-turning gear is also provided.

The Duralumin floats, of typical Short form and construction, are of very large dimensions, as will be realised when it is pointed out that each float is nearly 40 ft. long, while the displacement is 22,500 lb. The floats are mounted on struts from the outer points of the outriggers, and are braced laterally by diagonal struts to the lower longerons.

Although primarily an experimental aircraft, the " Valetta " is completely equipped for passenger service. The cabin, which measures 17 ft. in length by 6 ft. 2 in. in width and 6 ft. in height, has seating accommodation for 16 passengers, but this number is subject to alteration according to the service for which the machine is required. The seats are similar to those used in the " Calcutta " and consist of a tubular framework, with air cushions for seats and backs,







THE SHORT "VALETTA" : Outrigger strut bracing is used for wing and floats. The outrigger struts are of circular section, while the wing bracing struts are of built-up box section with a streamline fairing added. Details of the joint between outriggers, wing struts and float struts are shown analytically. (FLIGHT *Sketches.*)

the air cushions being removable and so designed that they can be used as life belts in emergency.

The ventilation system has been carefully thought out, and the windows are set low in the side walls of the cabin so that passengers can look out and down on the sea without craning their necks.

Aft of the cabin is a large lavatory fitted up with wash basin, &c., and aft of that again is the luggage hold, which has a large hatch in the roof through which the luggage can be hoisted by means of a portable derrick carried on board. The luggage hold hatch also serves as an emergency exit for the passengers. Entrance to the cabin is by a door in the port side, and when boarding the machine from a launch, passengers walk up a narrow stairway formed on the side of one of the float struts.

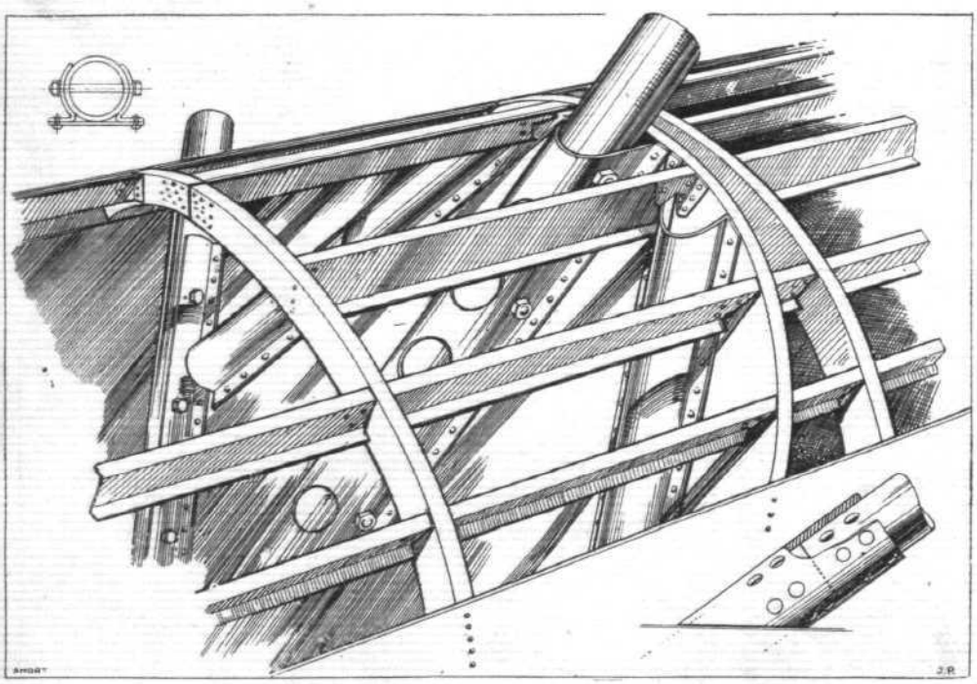
Ahead of the cabin, and communicating with it by means of a sliding door, is the pilots' cockpit. This is situated near the nose of the fuselage, immediately behind the central engine, and from it a very good view in all directions is obtained. Provision is made for two pilots, placed side by side on seats which can be raised and lowered. The windscreen surrounds the whole front portion of the pilots' cockpit, and a sliding panel is provided in the roof, while the side windows in the cockpit are made to slide. In the after part of the cockpit there is space for the wireless equipment, the "Valetta" being provided with transmitting and receiving apparatus. The equipment consists of a Marconi A.D.8 set, which has a range, under normal atmospheric conditions, of about 300-400 miles on C.W. telegraphy, and 200-250 miles on telephony.

The Short "Valetta" is probably the first British machine of its kind to have been designed primarily as a seaplane, but with a land undercarriage designed concurrently. The substitution of the land undercarriage for the floats is a very simple affair, and for use on long air routes, such as over great portions of the British Empire, an operating company would benefit considerably by this interchangeability, as the one type of machine can be used on all stages of the route, the number of spares required being correspondingly reduced.

The main dimensions of the "Valetta" are shown on the general arrangement drawings. The tare weight is 14,535 lb. (6,605 kg.) as a seaplane, inclusive of cabin equipment, and as a landplane the tare weight is 13,985 lb. (6,365 kg.). The disposable load is the same in both versions, *i.e.*, 7,865 lb. (3,575 kg.), giving a gross weight for the seaplane of 22,400 lb. (10,180 kg.), and 21,850 lb. (9,940 kg.) for the landplane.



THREE STAGES IN THE TAKE-OFF OF THE "VALETTA": Note the clean running shown in the lower photograph.



THE SHORT "VALETTA": Details of float construction and of float strut attachments. (FLIGHT *Sketches.*)

The disposable load is made up as follows: Crew and kit, 660 lb.; passengers (16) and luggage, 3,360 lb.; wireless equipment, 340 lb.; electrical equipment, 75 lb.; instruments, marine, equipment fire extinguishers and miscellaneous 430 lb. Total useful load, 4,865 lb. Fuel and oil account for another 3,000 lb., *i.e.*, petrol (350 gallons); 2,730 lb., and oil (27 gallons), 270 lb.

The estimated performance of the "Valetta" as a seaplane is as follows: Maximum speed at sea level, 135 m.p.h. (217 km./h.). Cruising speed at 1,800 r.p.m., 105-110 m.p.h. (169-177 km./h.). Minimum speed, 65 m.p.h. (104·5 km./h.). Sea level rate of climb, 850 ft./min. Time to 10,000 ft. 18·5 min. Service ceiling, 14,000 ft. (4,270 m.). Absolute ceiling, 16,000 ft. (4,880 m.). Range at cruising speed, 520 miles (835 km.).

For the landplane the figures are very similar, but the top speed is slightly better (138 m.p.h.), and the rate of climb is 880 ft./min., while the service ceiling is 14,800 ft. and the climb to 10,000 ft. occupies 17·5 min.

◈ ◈ ◈ ◈

Air Mail Connections with Liners

AN air mail service from Cologne to Cherbourg was opened on July 16. The aeroplane left Cologne at 10 a.m. and landed at Cherbourg at 2.30 p.m., in time for its mail to be transferred on board the *Europa*, which left later for New York. On July 17 the "catapult" air service from the French liner *Ile de France* was resumed. The aeroplane left the liner off the Scilly Isles and dropped mails for London in Plymouth Sound, where a motor vessel was waiting to pick them up, and then flew on to Paris.

THE SARO "FLYING CLOUD"

An Amphibian Boat with Two "Whirlwind" Engines

FEW machines among those exhibited at the Olympia Aero Show last year attracted greater or more favourable attention than the little "Cutty Sark" flying-boat exhibited by Saunders-Roe, of Cowes. There was something irresistibly pleasing about the lines of the machine, and the four-seater cabin was so obviously comfortable while at the same time providing an excellent view for passengers as well as pilot. Since that time several "Cutty Sarks" have been produced and put into service, and the expectations of the designers were fully realised

When the little "Cutty Sark" was first laid down she was regarded by the Saunders-Roe firm, not as an isolated type, but as the beginning of a whole "family," of which she was to be the smallest. In fact, two larger versions were "sketched out" at the same time that the first "Cutty Sark" was being built; these were given the names "Windhover" and "Flying Cloud" respectively—the former to be a four-five-seater and the latter a six-eight-seater. Both types were put in hand some time ago, and the first of the larger boats has now been completed, and was launched on July 16. This is the larger of the two, the "Flying Cloud," a twin-engined amphibian flying-boat fitted with Wright "Whirlwind" engines.

SARO "FLYING CLOUD"
2 Wright "Whirlwind"

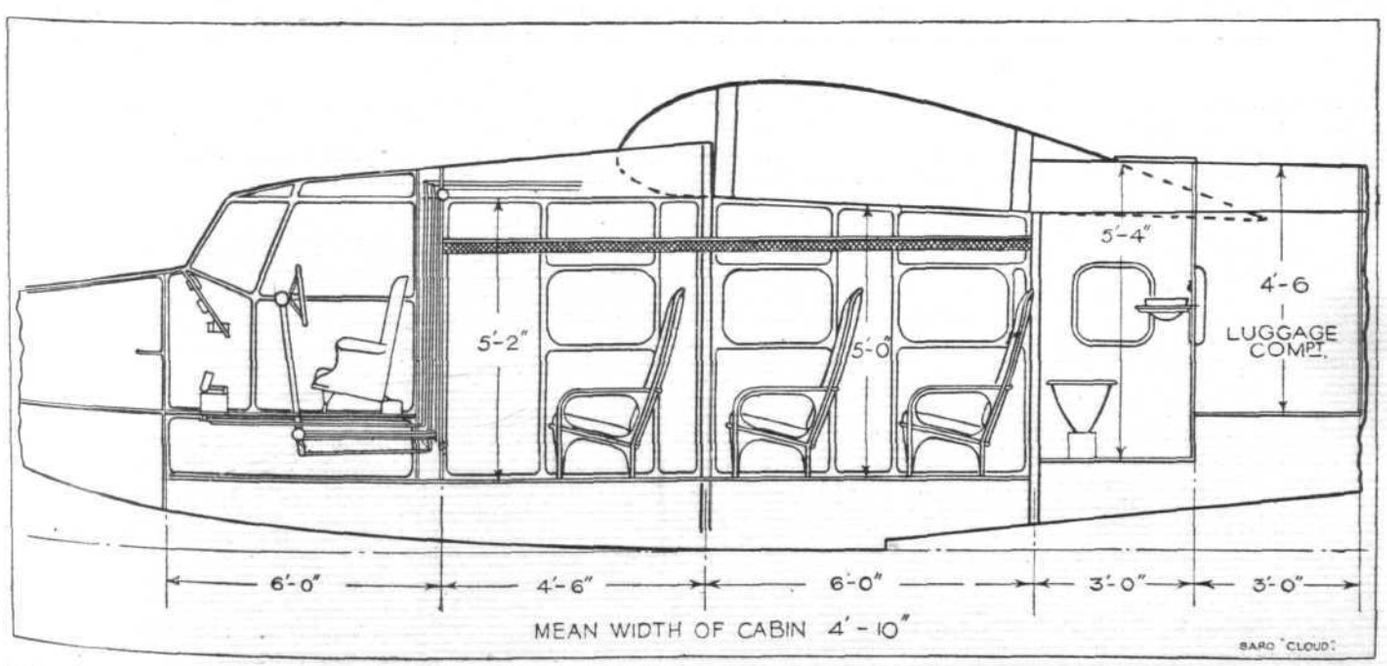
Length, o.a. ..	47 *ft.* 9 *in.* (14·56 *m.*).
Wing Span	64 *ft.* (19·5 *m.*).
Wing Chord, max. ..	12 *ft.* (3·65 *m.*).
Wing Chord, min. ..	7 *ft.* 3 *in.* (2·2 *m.*).
Hull length	44 *ft.* 6 *in.* (13·6 *m.*).
Height overall ..	13 *ft.* (3·9 *m.*).
Chassis Track ..	14 *ft.* (4·3 *m.*).
Maximum Beam of Hull	5 *ft.* 9 *in.* (1·8 *m.*).
Area of Wing (total) ..	650 *sq. ft.* (60·4 *sq. m.*).
Area of two Ailerons ..	37 *sq. ft.* (3·42 *sq. m.*).
Area of Tailplane ..	49 *sq. ft.* (4·6 *sq. m.*).
Area of Elevators ..	38 *sq. ft.* (3·53 *sq. m.*).
Area of Fin	20 *sq. ft.* (1·86 *sq. m.*).
Area of Rudder ..	23 *sq. ft.* (2·14 *sq. m.*).
Tare Weight	5,500 *lb.* (2,490 *kg.*).
Pay Load	1,420 *lb.* (644 *kg.*).
Pilot	160 *lb.* (72·5 *kg.*).
Fuel and Oil (four hours)	1,020 *lb.* (463 *kg.*).
Gross Weight	8,100 *lb.* (3,760 *kg.*).
Wing Loading ..	12·5 *lb./sq. ft.* (61 *kg./sq. m.*).
Power Loading ..	13·5 *lb./h.p.* (6·45 *kg./CV.*).
Maximum Speed at Sea Level	120 *m.p.h.* (193 *km./h.*).
Cruising Speed ..	95 *m.p.h.* (153 *km./h.*).
Landing Speed ..	55 *m.p.h.* (88 *km.h.*).

These figures refer to the Amphibian. Without the land undercarriage the pay load is greater and the performance slightly better.

In a general way, the Saro "Flying Cloud" is very similar to, but an enlarged version of, the "Cutty Sark." Detail improvements have, however, been made where experience with the smaller machine indicated the advisability of making changes. These are of a minor character, and essentially the "Flying Cloud" is a large "Cutty Sark." Seaworthiness is a relative term, and although the little "Cutty Sark" is seaworthy enough for use along the coast or over fairly sheltered bays and river estuaries, she is not claimed to be designed for use over the open sea, although one is being used now on the new service between Woolston, Southampton, and the Channel Islands. The "Flying Cloud," with its larger hull, greater propeller clearance and wider beam, may be expected to be sufficiently seaworthy for use over quite large stretches of open sea, such as are found in almost any part of the British Empire.

The form of hull construction employed in the "Flying Cloud" is similar to that of the "Cutty Sark," and consists of perfectly straight-sided frames covered with a planking of "Alclad," an aluminium alloy covered with a layer of pure aluminium, which is very resistant to corrosion. The Saunders-Roe firm has patented a form of metal planking in which parallel corrugations spaced some inches apart run in a fore-and-aft direction, the corrugations crossing the hull frames at right angles. By corrugating the planking itself in this manner, longitudinal stringers become unnecessary, and a good deal of riveting is avoided. At the same time the plain, straight-sided frames and flat planking provide a very simple form of construction, as the planking can be put on "in the flat" and no panel beating is required.

The Saunders-Roe hulls have another special feature, which is really the outcome of the use of straight frames, and the desire to avoid panel beating. This consists in joining to the vee bottom at the chines a narrow horizontal strip, or fore-and-aft step, which not only strengthens the construction, but also serves to throw the water outwards



THE SARO "FLYING CLOUD": **This Side Elevation of the Accommodation indicates the arrangement of the seats in the cabin and cockpit.**

instead of upwards, as happens with a plain straight vee bottom.

Lateral stability on the water is obtained by the use of wing floats, of a construction similar to that of the main hull.

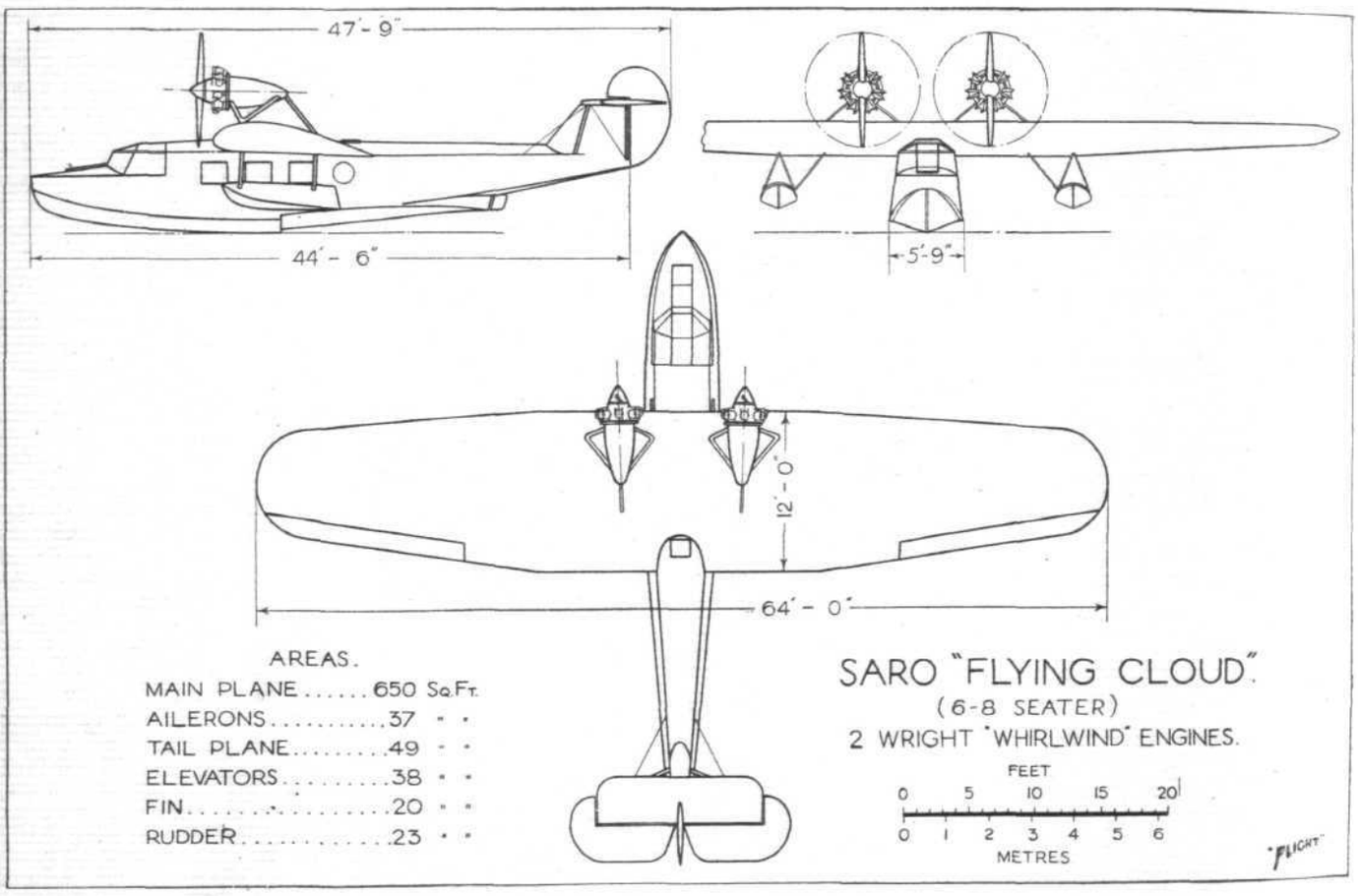
The monoplane wing is of the pure cantilever type, and of all-wood construction. There are two main spars, of box-section, with spruce flanges and three-ply walls. The ribs are of three-ply. The wing planking, also of three-ply, is made entirely watertight, so that in case of damage to the hull, the wing would probably keep the machine afloat for quite a considerable period. The inspection doors provided here and there on the wing are made a watertight fit, and where controls, etc., pass through the wing covering, they pass through sleeves or glands. The only holes in the wing are small vent holes in the trailing edge, the lowest point in the wing. The upper wing surface is planked, in the neighbourhood of the engines, with stouter plywood so as to enable the crew to walk on the wing for attending the engines.

The power plant of the first "Flying Cloud" consists of two Wright "Whirlwind" engines driving tractor airscrews. Other engines of approximately the same power can, however, be fitted if desired. The engines are cowled in by streamline fairings or nacelles, and are supported on a simple structure resting on the wing. The engines are easily started by means of the hand turning gear, the engineer standing on the wing at the side of the engine. Or if desired a Heywood-Jap starter can be fitted at slight extra cost.

With the high position of the engines, gravity feed is not possible, and the petrol, contained in tanks in the wing, is forced to the engines by A.M. pumps, one to each engine. To guard against failure in the petrol supply system, a cross-connection is made so that both engines can be supplied by one pump, the capacity of the pump being sufficient for both engines. The lubricating oil is carried in conical tanks formed to the shape of the tail portion of the engine cowling. In this position the tank forms its own oil cooler by having its surface exposed to the slipstream.

Such few steel fittings as are used—for example, the four simple fittings by means of which the wing is attached to the boat hull—are either made of rustless steel or are protected by a cadmium plating. The hull, the planking of which is already in itself greatly resistant to corrosion, is enamelled as is also the wing covering. All aluminium and Duralumin parts used elsewhere are anodically treated against corrosion.

The land undercarriage is of the retractable type, and consists of two tripods, one on each side, formed by the bent axle, the radius rod, and the telescopic leg. The inner end of the axle is hinged to the specially strengthened frame carrying the front wing spar, while the radius rod is hinged to the rear spar frame. Both hinges are above the water line so as to avoid making the machine "dirty" during take-off. The telescopic leg is provided with rubber compression blocks as well as oleo gear. The initial shock of landing is taken on the oil.



THE SARO "FLYING CLOUD": General Arrangement Drawings, to Scale. The machine is here shown as a plain flying-boat, but an amphibian undercarriage is actually fitted on the first machine launched.

Accommodation

The "Flying Cloud" is designed to carry normally six passengers. The cabin is placed under and ahead of the wing, and large side windows and a transparent roof panel give plenty of light and air. The floor of the narrow gangway which runs between the two rows of seats is on a slightly lower level than the floor under the seats, and the headroom above the central gangway floor is 5 ft. 9 in.

The pilot's cockpit is ahead of the cabin, and is entirely enclosed. Access to it is by a sliding hatch on the fore deck, and the central portion of the windscreen, which is hinged. The windscreen panels are of "Triplex," while the side window and roof panels are of celluloid. The side panels are made to slide so that the pilot can lean out and look straight down for landing or for manœuvring on the water.

Aft of the cabin is a lavatory with wash basin, and behind that again is a large luggage compartment.

The extreme bows of the hull have a compartment for the stowing of warps, anchor and other marine gear, the compartment being closed by a hatch in the deck.

The main data relating to the "Flying Cloud" are given in the table on p. 831, and some are also shown on the general arrangement drawings above. The amphibian version of the machine has a pay load, for a range of about 380 miles, of 1,420 lb., which can be used either for passengers or, by removing the chairs from the cabin, for freight and/or mails.

PRIVATE FLYING AND CLUB NEWS

MRS. BALDWIN'S GARDEN PARTY

MRS. BALDWIN set a seal to the "everydayness" of aviation by arranging an aerial garden party at Hanworth, on Saturday, July 19, in aid of the National Birthday Trust Fund (for the extension of Maternity Services) and for her appeal for anæsthetics.

This is the sort of thing which brings aviation on a par with all other popular amusements and, therefore, assures it taking its place among the everyday things of this world.



Actually, of course, Mrs. Baldwin was, by this meeting, merely using aviation as a peg upon which to hang her appeal but the fact that she did so with a reasonable chance of making it a success does show that the general public are at last beginning to accept flying in the same way as they accept all the other ordinary businesses and amusements—though it might well be said that all public amusements are somebodies' business — a fact for which we should all be very grateful.

Whether or not Mrs. Baldwin's funds profited materially from the meeting, it is difficult to say, but apparently very little use had been made of advertising to the general public, and, consequently, the cheaper enclosures held only a mere handful of spectators. The Club enclosure was reasonably full, but in all probability those present included a large percentage of invited guests, which would make it seem that financially, at any rate, the funds had not benefited to any great extent. From the point of view of publicity, however, a considerable benefit must have accrued and we can only hope that this publicity has sown seeds which will fructify at an early date.

From an aeronautical aspect the chief item of interest was the Hanworth-Reading-Farnborough - Hanworth Race.

This was open to all comers and was two laps of the above course, making a total distance of about 108 miles.

As the handicapping was done by Messrs. Dancy and Rowarth, we naturally expected a tight finish, and we got it! As can be seen from the table, less than four minutes covered all the finishers.

It was unfortunate that the first machine home, Sqdn.-Ldr. F. E. Guest, should have been disqualified, but it is understood that he cut the corner at Reading (Woodley Aerodrome).

It was particularly pleasing the way the first three actually panned out. Capt. E. W. Percival, with his Hendy 302, was very unlucky in the King's Cup Race, as but for compass trouble, he would most probably have flown into second place, and since his machine is a new design, his win was received with acclamation by all.

Capt. Percival won a cup presented by Sir Philip Sassoon and £75 for being first, and another cup presented by Sir Julian Cahn and £50 for the highest speed in the race.

Mr. C. S. Napier, a son of the designer of the well-known "Lion" engine, flew his Widgeon into second place. This we were also very gratified to see, as Mr. Napier, together with his friend Mr. Miyahara, worked very hard to prepare his Widgeon for the King's Cup without gaining any success in the race, and since he is a *bona fide* private entry and keen amateur pilot, his achievement on this occasion is really a splendid effort and well merited. He wins a cup presented by Sir Philip Sassoon and £50.

The third prize, another cup from Sir Philip and £25, was won by Mr. W. A. Andrews, in a Spartan, another of our newer light aircraft.

The Empire Prize, a silver cup presented by the Duke of



MRS. BALDWIN'S FLYING MEETING : **The group above includes, from left to right, Mr. Baldwin, Mrs. Cleaver, Mrs. Baldwin, the Countess of Bessborough, the Duchess of Bedford, and Col. the Master of Sempill.**

Right :—**Captain Rawson "crazy-flying" on the Cierva "Autogiro."** (FLIGHT *Photos.*)

Sutherland, was won by Sqd.-Ldr. A. B. Shearer, who was representing Canada.

There was an arrival competition, with prizes for the first and second pilots to land after 1.0 p.m., and these were won by Sqd.-Ldr. Shearer and F./O. T. N. McEvoy respectively.

Preceding the start of the race there was a parade and fly past of most of the different machines present. During this a regrettable accident occurred to the new Desoutter II. It was flown by Mr. P. Sayer, and as far as can be gathered what happened was that while diving down to the aerodrome the machine hit a bump which apparently caused aileron flutter to start, this rapidly increased and was transferred to the wing until the aileron hinges were nearly torn out and finally the aileron actuating gear between the bottom of the joystick and the ailerons carried away in several places. Mr. Sayer managed to get some height and speed off the machine with the tail units and landed heavily at the far end of the aerodrome collapsing one side of the undercarriage and spinning round on one wing tip. Luckily, neither he nor his passenger was damaged.

Flt.-Lt. Schofield followed up the start of the race with some aerobatics on a Moth (Cirrus III). Being Schofield, his exhibition was, of course, beyond any criticism.

Flt.-Lieut. Rawson then tilted his windmill at alarming angles and when flying round inside the confines of the aerodrome, proceeded to do flat and nearly vertically bank turns; finally, he evidently got fed up with flying and just let the machine fall vertically on to the aerodrome, and, being an Autogiro, it stood it!

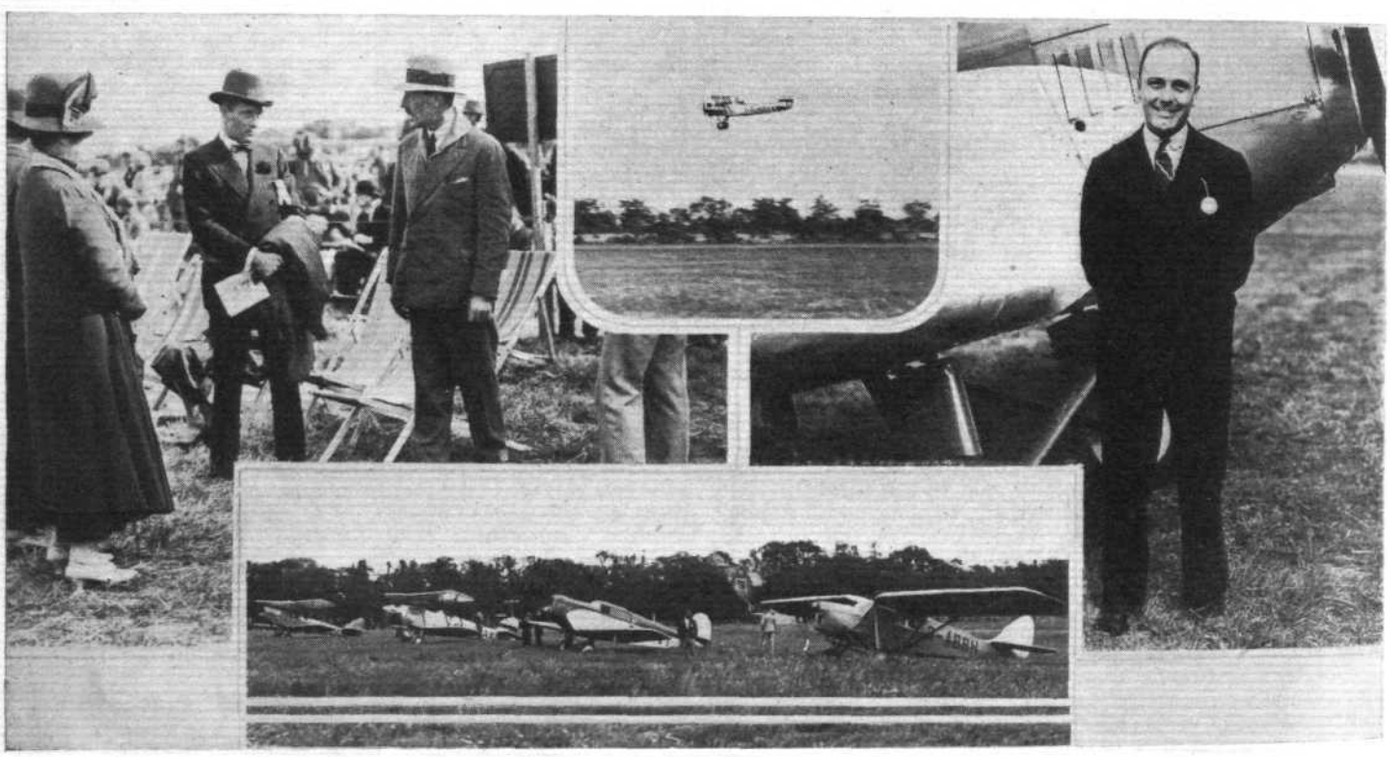
Perhaps one day we shall see him fly upside down, but for the present we are quite content to see the kind of inverted flying which Flt.-Lieut. Schofield next gave us on a Desoutter.

After the finish of the big race, Mr. John Tranum investigated the upper air currents in his Russell Lobe parachute—one almost said sail-plane, because when he parted company with Mr. Alliot and his Spartan at 1500 ft., he discovered that the breeze up there was about 35 m.p.h. and consequently he sailed gaily past the aerodrome and landed safely among the young cabbages on the far side of the boundary road.

Apart from the official announcement of Sqd.-Ldr. Guest's disqualification, this ended the programme and the spectators in the Club enclosure then gathered before the Clubhouse steps, where Mrs. Baldwin gave away the various cups and prizes which had been won during the afternoon.

Mrs. Baldwin is a fluent and forceful speaker, and during the wait for the arrival home of those in the race, she broadcast an appeal on behalf of her fund. Her husband, our late Premier, was among the many distinguished guests who paid Hanworth a visit during the afternoon.

For those who take a pleasure in following the working of the handicappers' minds, we publish the full details of the race in a table on the following page.



AT MRS. BALDWIN'S NATIONAL BIRTHDAY TRUST FUND MEETING AT HANWORTH: The lower photograph shows some of the faster machines lined up for the start. In the upper picture Sqd.-Ldr. Guest is seen finishing on his "Tomtit," and on the left he is seen explaining to Mrs. Baldwin that there is, apparently, some doubt as to his having won the race. Actually he was disqualified for not rounding a turning point properly, and the victory went to Capt. Percival (right) on the "Hendy 302." (FLIGHT *Photos.*)

CINQUE PORTS FLYING CLUB put in 58 hours' flying time for the week ending July 5. On Sunday, June 29, Mr. R. E. Nightingale, of Mayfield, Sussex, passed his flying tests for "A" licence, being followed on Wednesday by Mr. J. E. Malone, of Dublin, who had previous experience with the Irish Aero Club, and Mr. E. D. Crundall, of Dover, who is an ex-War pilot, and who was launched solo on Monday. The club has thus taken no less than nine "A" licences in ten days.

On Wednesday, July 2, we had the pleasure of a visit from Herr Magersuppe and Mr. Haller. Herr Magersuppe is, of course, the soaring expert attached to the *Daily Express*, and Mr. Haller is an American Power Pilot, who has just completed his course for his "C" soaring licence at a gliding school in Germany. Both tried out our Moth aircraft, and expressed themselves as delighted with them. Herr Magersuppe, who had practically no previous experience of power aircraft, flew the Moth exceedingly well.

We much regret to announce that owing to difficulties in connection with the visit of No. 601 Squadron A.A.F. to Lympne at August Holiday week end, and owing to the consequent long delay in obtaining the Air Ministry's approval and notice of the terms upon which the club would be allowed to stage the Meeting at Lympne, it is felt that there is no longer time to organise a meeting on the scale which was contemplated, and it has, therefore, been decided that the whole project should be abandoned, for this year at any rate.

The Sixth Competition for the Ashwell-Cooke Challenge Cup was flown on Sunday, July 6, at Lympne, under ideal conditions. There were seven entrants, all from members of this club, and the result was as follows:—

Competitor	Net Score on Handicap
1. Mr. K. Waller	81
2. Miss G. Aitken	48
3. Lieut.-Cmdr. T. S. B. Gubbins ..	30
4. Mr. P. W. Marriage	30

Mr. H. R. Law, unfortunately, had to scratch, and Miss J. E. Giles and Mr. R. Dallas Brett were both disqualified on both attempts. Mr. Waller is to be heartily congratulated on his success, as he has been the victim of very bad luck in at least two previous competitions, and his win was overdue

HANWORTH—READING—FARNBOROUGH—HANWORTH AIR RACE

Registration Mark	Entrant	Pilot	Aircraft	Engine	Starting Time (Min. Sec.)	Place 1st Lap	Finishing Time (Min. Sec.)	Average Speed	Final Place
G-EBOT	D. Marendaz ..	J. Rogers	Moth	Cirrus I ..	00 00	1	86 22	76½	12
G-EBYV	I. Parker	I. Parker	Moth	Cirrus II ..	10 46	2	84 20	89¾	7
G-EBJT	Dr. Whitehead Reid	Dr. Whitehead Reid..	Widgeon II ..	Genet II ..	16 10	10	Retired 1st lap at Hanworth		
G-ABCI	E. Stephen	F. Kirsch	Klemm ..	Cirrus III ..	16 30	6	84 15	97½	6
G-AAWY	Flt.-Lt. J. Addams	Flt.-Lt. J. Addams ..	Spartan Arrow	Hermes ..	16 30	4	85 08	96¼	10
G-EBTD	High Commissioner for South Africa	Capt. R. Douglas ..	Moth	Gipsy 1 ..	17 09	9	85 18	97	11
G-ABAZ	W. Andrews	W. Andrews	Spartan 3-str.	Hermes ..	17 09	3	83 53	99	**3**
G-AATB	W. Straight	W. Straight	Moth	Gipsy 1 ..	17 29	5	83 57	99¼	4
G-AADE	C. Napier	C. Napier	Widgeon ..	Gipsy 1 ..	18 07	7	82 20	101¼	**2**
G-AAMG	Flt.-Lt. A. Scroggs	Flt.-Lt. A. Scroggs ..	Spartan ..	Hermes ..	18 25	8	84 00	100¾	5
G-AABS	R. Dobson	D. Green	Avian	Genet Major ..	21 57	11	85 01	104½	9
G-AAYU	High Commissioner for Australia	Sqd.-Ldr. G. Jones	Avian	Hermes ..	26 05	12	Retired 1st lap at Hanworth		
G-ABAX	Sqd.-Ldr. F. Guest	Sqd.-Ldr. F. Guest	Tomtit ..	Mongoose IIIa	30 07	13	81 51	Disqualified.	
G-AAVT	Capt. E. Percival ..	Capt. E. Percival ..	Hendy 302 ..	Hermes ..	31 08	14	82 32	128½	**1**
G-ABBH	High Commissioner for Canada	Sqd.-Ldr. A. Shearer	Puss-Moth ..	Gipsy III ..	31 26	15	84 32	124¼	8

SINGAPORE FLYING CLUB.—The total flying time for the month of January amounted to 51 hr. 5 min.

Weather during the month was bad, the condition of the water being such as to prevent flying on most afternoons.

For February the flying time was 63 hr.

On February 5 three machines flew in formation to meet H.E. the Governor (Sir Cecil Clementi) on his arrival from Hongkong in the s.s. *Mantua*.

The majority of the flying this month was done in the early mornings as with the monsoon the sea gets up about 9.30 a.m., and precludes flying for the rest of the day.

The race for the Carnegie Challenge Cup, kindly presented by Flight-Lieut. D. V. Carnegie, A.F.C., R.A.F., was originally to have taken place on February 15, but, as the weather was unfit, it was flown on the following day. This, the first aerial race to take place in Malaya, was over a circuit of about 7 miles, and was open to all members of the Club holding "A" Licences. Competitors taxied to a given point, and the time was taken from the opening up of the engine to their return to the raft after having completed the course and alighted. It will be seen, therefore, that judgment in alighting counted for more than actual speed.

There were eight entrants, the winner being M. J. Field, whose time was 5 min. 31½ sec. G. Watts came in second, 2½ seconds behind the winner.

On February 9, the Club reached the 1,000 hours' mark of total flying time since its formation.

The Club held its Annual Dinner on February 27, at which H.E. the Governor was the guest of honour. Opportunity was taken of this occasion to make a presentation to the Club Captain, Flight-Lieut. D. V. Carnegie, A.F.C., R.A.F., on his departure on leave to England as some slight recognition of all that he has done for the Club from its very commencement. This took the form of a silver salver, on which were engraved in facsimile the signatures of the members of the Club; a silver model of a "Moth" is also being obtained and will be handed to Flight-Lieut. D. V. Carnegie in England by the Wing Commodore, Mr. G. W. A. Trimmer.

For March the flying time amounted to the not inconsiderable total of 94 hr. 55 min.

On March 2 H.E. the Governor flew round the island in one of the Club's Moths, piloted by the Club Captain and escorted by one of the other machines. It is singularly fortunate that the two Governors, who have held office since the formation of the club, have shown such interest in aviation

On March 3 the three Club machines flew in formation over the s.s. *City of Marseilles*, to bid farewell to the Club Captain, Flight-Lieut. D. V. Carnegie, who proceeded on leave to England by that steamer. The Club feels it impossible adequately to express their thanks to Flight-Lieut. D. V. Carnegie for his never-failing help and advice, and it is most unfortunate that there appears little chance of his returning to Singapore; at any rate, for some considerable time.

The Annual General Meeting was held in the Club House on March 3, at which the following officers and committees were elected:—

Wing Commodore: F. Lundon; Club Captain: Flight-Lieut. J. Titmus, R.A.F.; Vice-Captain: R. Gardiner; General Committee: H. Shook, G. Watts, P. T. Hutchings, T. Graham, E. Rhodes, Lt. W. M. Blagden, R.E. Flight Committee: Flight-Lieut. J. Titmus, R.A.F., H. Shook, G. Watts. House Committee: A. Cairns, J. C. Parkinson.

For April the flying time constituted a new record, having amounted to 135 hr. 55 min.

THE HENDY 302: This machine would have stood a very good chance in the King's Cup Race had compass trouble not intervened. It is unique as our only low-wing cabin monoplane.
(FLIGHT *Photo.*)

BROOKLANDS SCHOOL OF FLYING is trying to organise a race from Brooklands to Brighton and back, in the near future. A Gold Cup has been offered by Mr. A. R. Pole, of "Woodstock," St. George's Hill, and Mr. Volk, of Brighton, has arranged to collect some money prizes. All prospective competitors should communicate with the School at Brooklands.



AN INDIAN CHIEF : The Chief of Bhor who is at present visiting this country, is here seen at Hanworth Park with his retinue. He is standing fifth from the left with Mr. H. R. Law, and Mr. and Mrs. R. Law, who acted as his hosts, next to him. Bhor is a small state in the Bombay Presidency. The Chief is understood to be considering learning to fly himself. (FLIGHT *Photo.*)

THE BROOKLANDS SCHOOL OF FLYING is finding that its claim to " provide instruction without waiting from sunrise to sunset " is being taken seriously by enthusiasts, who phone before they leave for the aerodrome, in order to have machine and instructor waiting when they arrive. So far, it has always been possible to do so.

This appeals particularly to city folk, who are finding it possible to drive down to Weybridge, spend half-an-hour in the air, and return in a two-hours' lunch interval.

The list of pupils continues to represent what politicians call " every walk of life." At present among those having instructional or refresher courses are Sir Horace Plunkett, Sir Anthony Hogg, Mr. Kaye Don, Miss Emma Haig, Miss Marjorie Mars, Miss Muntz, the Hon. Mrs. Victor Bruce, Mr. Shin Kau Lee, and Mr. Zafargi Khan. In other words, aviation is appealing equally to agricultural experts, racing motorists, lawyers, actresses, the son of a mandarin, and the cousin of an oriental potentate, of ages ranging from 18 to 75.

Flying during the last fortnight amounted to 69 hrs. Mr. Bowles who, a short time ago, qualified for his pilot's " A " licence has taken delivery of his new Gipsy Moth.

The two Moths which were prepared by the School for the King's Cup completed the course without any trouble whatsoever. One of them was a standard Gipsy Moth flown by Mrs. Young and navigated by Mr. George Lowdell, and this averaged 99·29 m.p.h. The other machine, a special stream-lined Gipsy Moth flown by Maj. Pickthorn and navigated by Capt. Jones put up an average of 106·2 m.p.h.

The directors are pleased to announce that arrangements have been made for a fully qualified lecturer and practical engineer to hold a 10-days' course at Brooklands, commencing Tuesday, August 5, on aircraft and engine maintenance. Circular letters have been sent to all private owners, giving particulars and the fee for the course will be based on the amount of support received. Further particulars can be supplied upon application to the Brooklands School of Flying.

A NEW SOUTH COAST AERODROME.—Among the many aerodromes which are available along the south coast, is a new one which has been opened at Ford, by the D.W. Aircraft Co. They have now moved from Brooklands, and are proposing to carry on their manufacturing business with the new D.W.2 in the large hangars which are available at Ford. These hangars are relics of the days when the aerodrome was in use during the war, and provide ample space for anything the new company is likely to require. There is also a suggestion that instruction and joy riding will be carried out there, but with the aerodrome so far from civilisation it seems difficult to believe that there will be a lucrative opening for this sort of business, especially in view of the fact that clubs are already situated near most of the large residential centres.

AIR PORT OF MANCHESTER.—On August 30 the Liverpool-Manchester Inter-City Air Race will be held for the Cundiff Trophy. This is an annual event and has proved extremely popular. There will be a small flying display at Barton on this occasion.

AERIAL HOLIDAY ROUND AUSTRALIA.—The first round-Australia aerial holiday was completed with the arrival back in Sydney on April 27, after an 8,000-miles trip, of Messrs. Bardsley, Annabel and Wedgwood, three young Sydney pilots belonging to the Australian Aero Club.

Accompanied by mechanics and each flying a Gipsy Moth, they took off in formation from Mascot, Sydney, on April 3, for Longreach, Cloncurry and Camooweal. Their course lay over extremely difficult country between Wave Hill and Wyndham, from thence to Derby and Hall's Creek. Over the Kimberleys they experienced the worst flying conditions of the whole trip—great fissures in the earth up to 200 yards wide appeared to run for miles, making anything in the nature of a successful forced landing out of the question.

The roughest country passed over was between Wave Hill and Wyndham. The route was mapped out so that they would spend the night at a town or station, with a halt at mid-day for lunch. In this way they covered in comfort between 400 and 500 miles a day.

From Perth the fliers followed the route of last year's Centennial East West Race (in which Bardsley had been a competitor), through Rawlinna and Cooke to Adelaide and Melbourne. Actually the flying days did not number more than 18, and the average speed of the fliers was estimated at about 80 miles an hour.

All three fliers were very enthusiastic about the trip. In Bardsley's words, they have " learned more of Australia in three weeks than you could learn in 10 years by other means." All supplies were arranged by Shell, and the aviators paid tribute to the fine organisation at their disposal throughout the trip. In their own words their machines " ticked over like little Waterbury watches the whole time."

THE AIRSHIP CLUB, affiliated to the R.A.C., and owning three balloons, has made an arrangement with the Airship Development Co., which owns the small airship A.D.1, under which members will be enabled to qualify for the Air Ministry's airship pilot's certificate.

The probable cost of qualifying as an airship pilot will be about £105 if the candidate is already a balloon pilot.

The airship is now at Capel, near Folkestone. It is a non-rigid of the " Blimp " class, of 60,000 cub. ft. capacity, with a 85 h.p. A.B.C. Hornet engine, and was described in FLIGHT for November 8, 1929.

The club balloons are at Guildford. Trips are arranged for members if due notice is given. The cost of qualifying for a balloon pilot's certificate is about £80.

THE GREAT INCREASE of over 60 per cent. in the number of club members holding " A " certificates is recorded in the " Report on the Progress of Civil Aviation, 1929," recently issued by the Air Ministry.

At the end of 1929 there were 13 subsidised clubs and eight unsubsidised.

The total membership of the subsidised clubs amounted to 3,648, as against 3,288 at the end of 1928, while 750 members then held pilots' licences.

In the British Empire there were 90 light aeroplane clubs at the end of 1929, 23 being in Canada, 19 in New Zealand and 9 in Australia.

The report comments upon the increased safety in air transport, and states that in the period 1925–29 there was only one fatal accident in 1,279,000 miles flown.

GLENN HAMMOND CURTISS HONOURED

"IN bestowing an honorary degree upon you, Mr. Curtiss, the University is not attempting to honor you, but is merely recognizing the things you have accomplished."

With these words, President Bowman Foster Ashe of the University of Miami, at Coral Gables, Florida, handed to Glenn Hammond Curtiss, pioneer pathfinder and many-sided developer of aviation, a diploma which created him a Doctor of Science, while Dr. O. J. Sieplein, head of the Science Department, placed on Mr. Curtiss' shoulders the ornate hood which proclaimed his new academic status.

The ceremony of investiture was a feature of the Commencement of the University of Miami, on June 9. It was likened by one speaker to a ceremony which had lately taken place in Washington, in which President Hoover conferred long overdue honours upon Comdr. John H. Towers, U.S.N., who commanded the first expedition to cross the Atlantic by air in a Navy-Curtiss flying-boat, apologising in the name of the nation for the delay. Honours were being conferred upon Mr. Curtiss after a lapse of years had proved beyond doubt the true nature and measure of his service to mankind.

In presenting Mr. Curtiss for the degree before a brilliant assembly of about 1,000 persons, Dr. Sieplein thus concisely enumerated the inventor-aviator's achievements:—"Mr. Curtiss, yours is a record of 'firsts.' You won the first aviation trophy in the United States. You brought the James Gordon Bennett cup to America. In 1910, you brought true the dream of the ages by flying from Albany to New York. You supplied the Army with its first dirigible. You were the first to land a 'plane on the deck of a battleship. You invented the hydroaeroplane and the flying-boat and thus opened the way for trans-Atlantic flight. You were the first to establish flying fields: Miami owes its Municipal Field to you.

"Your name has twice been linked with that of Langley, who blazed the way for aviation: once, when you flew the Langley 'aerodrome' which had been pronounced unflyable, and again, when you were awarded the Langley medal by the Smithsonian Institution.

"President Ashe, I deem it a great honour to present Glenn Hammond Curtiss to you for the honorary degree of Doctor of Science, using the words of Dr. Albert F. Zahm, of the Guggenheim Chair of Aeronautics: 'He has done more to develop the science and art of Aviation than any other individual.'"



Glenn Hammond Curtiss (centre) being presented with the Diploma and Hood of Doctor of Science by President B. F. Ashe, of the University of Miami (left) and Dr. O. J. Sieplein (right).

It was fitting that Doctor Curtiss should be acclaimed by the Miami institution of learning, since Miami, with its Pan-American Airways 'planes flying down the west coast of South America, its Nyrba 'planes flying down the east coast of the other continent, its Goodyear station for dirigibles and its aviation payroll of 5,000 persons, has assumed a conspicuous place in the flying world which Curtiss did so much to create.

Ensign Frederick H. Given, head of the Department of Aviation of the University of Miami, is also commander of the Naval Reserve Aviation Division VN-8RD7, and students enrolling in this Reserve unit receive their flight training with Government officers. Upon completion of their secondary training they will be entitled to commissions as ensigns and will be detailed for service at a Naval Station or with the fleet. During the eighteen months that the University aviation department has existed, under the direction of Ensign Given, 150 men have completed the course, and many are now in the more than forty branches of work that aviation training opens up.



Air Defence of Great Britain

THE Air Ministry announces the following appointment: Air Vice-Marshal Cyril Louis Norton Newall, C.B., C.M.G., C.B.E., A.M., now Director of Operations and Intelligence, Air Ministry, and Deputy Chief of the Air Staff to be Air Officer Commanding, Wessex Bombing Area, Air Defence of Great Britain, in February, 1931, *vice* Air Vice-Marshal Sir John Miles Steel, K.B.E., C.B., C.M.G., on the latter assuming command of the Royal Air Force in India.

Twice a Caterpillar

FOR the second time within three months, Pilot Officer J. Heber Percy, No. 43 (Fighter) Squadron, R.A.F., Tangmere, has saved his life with the same Irvin Air Chute. On the first occasion, in April last, he escaped from a collision. The second escape occurred on June 19, whilst he was practising for the Royal Air Force Display. The interesting question that arises from his experience and that of other airmen who escape with Irvin Air Chutes more than once is, should they receive a "bar" to their Caterpillar Pin?

The "Cutty Sark" and the Channel Islands

SAUNDERS-ROE, LTD., of East Cowes, have received the following letter from Mr. S. S. Kirsten, of Kirsten and Mace, in connection with the Saro "Cutty Sark" amphibian employed on the Southampton-Channel Islands service:—

"We are writing to give you some information regarding the air service which we have opened between England and the Channel Islands with your Cutty Sark type amphibian aircraft. As you know, we are running special trips to places on the French coast—Guernsey, etc.—in addition to our scheduled trips to England, and we have found your Cutty Sark to be the ideal type for such operations, which, as you will readily understand, entail our making the fullest possible use of the amphibian properties of this splendid little machine.

"Our initial machine has been christened by His Excellency the Governor of Jersey, General Willis, and Mrs. Willis, who afterwards were taken for a trip round the island, and were kind enough to express their great pleasure regarding the comfort of the machine and their good wishes for the future of our enterprise.

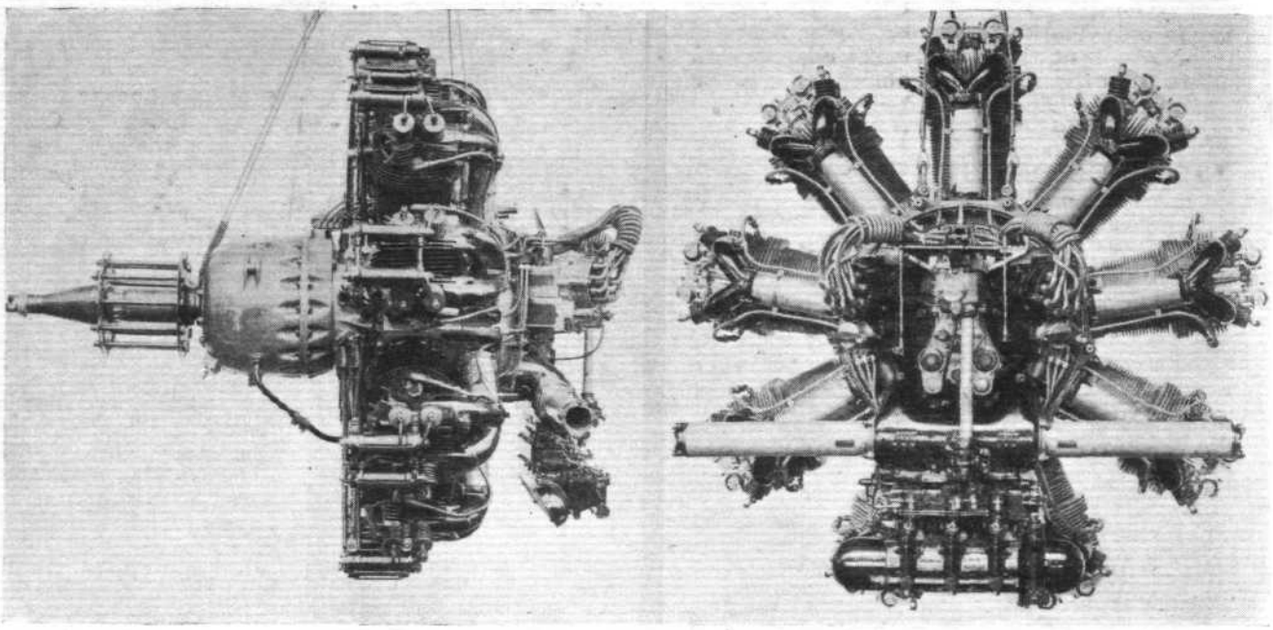
"The actual ceremony was preceded by a tea party very kindly given by Lady Trent, amongst the distinguished gathering being His Excellency the Governor of Jersey and Mrs. Willis, Lady Verney, Lady Houston, the Hon. Mrs. Holman, Lt.-Col. and Mrs. de Gallais, Lt.-Col. and Mrs. Carey, Col. and Mrs. Hulton, and many others. After the christening many of the party were taken up, and without exception expressed their great delight with the comfort and feeling of complete security afforded by this type of machine.

"We would like to take this opportunity of saying how pleased we are with the machine, and how well it is standing up to the work it is being given to do. We feel that we are in a very good position to say that this machine does definitely do all that is claimed for it, and, moreover, does it in that trouble-free way that is so absolutely essential for commercial operation.

"So delighted are we with our experiences of the Cutty Sark that we hope to take a very early delivery of the 'Flying Cloud' in order to cope with the demand that the Cutty Sark has set up."

THE BRISTOL "JUPITER XI.F"

Full-Throttle Type Test of the Commercial Type Geared Engine



THE BRISTOL "JUPITER XI.F": Side and rear views of the commercial type geared engine which passed its full throttle type test.

THE "F" type of Jupiter engine has now been in production for over 12 months, and during that time steady development has taken place, with many detailed improvements, throughout the engine.

The "Bristol" Company, confident of the high standard of reliability and performance to which the present production engines have been brought decided, with the Air Ministry's approval, to carry out with a standard production Jupiter XI.F Commercial type geared engine a 100-hours' test to the Air Ministry Type Test schedule, but with the endurance test carried out at full throttle, instead of the customary 90 per cent. throttle.

This test, which we understand was the first full throttle type test carried out on an air-cooled aero engine, was successfully completed (last month) in 10-hour non-stop runs, at 2,000 r.p.m., at an average full throttle power of 520 b.h.p.

Standard fuel and mineral oil were used, the consumptions throughout the test averaging 0·575 pts./b.h.p./hr. for fuel and 0·035 pts./b.h.p./hr. for oil. In view of the importance of consumptions under cruising conditions for commercial purposes, a ten-hour run was carried out, and under these conditions the fuel consumption was 0·55 pts./b.h.p./hr. and the oil 11·5 pts. per hour.

Despite the severity of the test, the engine maintained power well throughout, and on the final power curve, taken immediately after the completion of the 100 hours and the high-power and high-speed tests, the power developed was approximately 4 per cent. above the rated power for this type of engine.

The official Air Ministry report states that "No trouble was experienced with the engine throughout the whole test," while in dealing with the engine as stripped for inspection after the completion of the test, the report further states that, "The condition of the engine is extremely good."

The Schneider Crisis

THE Italian Royal Aero Club has not yet made any official announcement since the receipt of the letter from the Royal Aero Club of the United Kingdom, which declined to accept the proffered entry of three seaplanes for the next Schneider contest. The Italian press, however, has published a letter which is said to have been addressed by the Italian club to the F.A.I., on July 16. The letter runs as follows:—

"The contents of the letter of the British Aero Club cannot be acknowledged, and still less taken into consideration by the Italian Aero Club, in so far as they disregard the authority of the Fédération Aéronautique Internationale; whereas, on the other hand, the Royal Aero Club of Italy, being a federated body from its foundation, is determined that the authority of the Fédération Aéronautique Internationale, and of its directing organ, accepted by all the federated bodies, should not suffer from any disregard on the part of anybody. Consequently, the Royal Aero Club of Italy does not intend to discuss the decisions adopted by the general confederation of the Fédération Aéronautique Internationale in the way in which the British Royal Aero Club shows a desire to do.

Enclosed with the present letter, the said Fédération will find the sum of 16,500 francs, representing the payment of the entrance fee, and the guarantees for three Italian machines which the Royal Aero Club of Italy intends to enter in order to take part in the contest for the Schneider Trophy in 1931. Since the Press has published the *communique* of the British Royal Aero Club, in which is shown the British preoccupation concerning the organisation of the contest, the Royal Aero Club of Italy makes to the Fédération Aéronautique Internationale a proposal to organise a contest for the Schneider Trophy in 1931 at Venice without requiring the payment of any sum in guarantee at the moment of entry."

King's Cup Winner Visits the "House"

MISS WINIFRED BROWN was the guest of honour at the House of Commons on July 21. After being presented to the Prime Minister and Mr. Baldwin, she was entertained to tea in a private room by Mr. Lloyd George and the Speaker—and by several "gate-crasher" M.P.'s. Miss Brown was also entertained at dinner on July 22 at Manchester by the Members of the Lancashire Aero Club, the Lord Mayor of Manchester being amongst those present. Mr. J. D. Siddeley, during the proceedings, said he would have great pleasure in presenting Miss Brown with a new Avro machine.

No. 600 (City of London) (Bomber) Squadron

NO. 600 CITY OF LONDON SQUADRON, of the Auxiliary Air Force, is in need of town headquarters. The Territorial Association of the City of London is considering the matter and is pressing the Air Ministry to find money for this purpose.

Death of Mr. Ernest Brown

WE regret to announce the death, which took place on July 12, of Mr. Ernest Brown, one of the pioneers of the Cycle, Motor and Aviation Accessory Trade. Mr. Ernest Brown and his two brothers founded, in 1889, the well-known firm of Brown Brothers, at Great Eastern Street, London, E.C. The firm had already become famous in the cycle and motor industry when aviation started to make headway in this country, and they did not miss the opportunity of catering for this new industry in the same thorough way.

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

July 25, 1930

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COMPARISON OF AIRCRAFT

By Captain P. H. Sumner

Comparison between various types of aircraft, in order to assess the relative "efficiency," is rendered difficult by the number of variables which, if the comparison is to be fair, should enter into any system of estimating a "figure of merit." Prof. Everling has evolved three such "figures of merit"—the "high-speed figure," the "distance figure," and the "altitude figure." (See The Aircraft Engineer *of November 25, 1926, and Mr. Mettam's comments in the issue of February 24, 1927). Other methods have been suggested and are in use, but still no entirely satisfactory basis for comparison has been evolved. When one is comparing aircraft of one particular type, the comparison is less difficult. For example, if one takes a class like the interceptor fighter, all the machines in which have to carry the same military load, it is not difficult to compare the performances on a basis of horse-power. When, however, it is desired to make a comparison between types differing greatly in their characteristics—such as, for instance, a heavy flying-boat and a single-seater fighter—it is very difficult indeed to discover a basis upon which a comparison can be made.*

In the following pages Capt. Sumner has attempted to utilise the basis suggested by Guglielmetti and Tripodi, but even so he has found it necessary to group the various machines into classes. And the bases employed—speed per horse-power, useful load per horse-power, and ceiling per horse-power—lead to results which have to be interpreted with a good deal of care, if unfair and misleading deductions are to be avoided.—Ed.

Simple ratio values which permit of a rapid comparison of the flight and load characteristics of aircraft have been suggested by Major Guglielmetti and A. Tripodi of the Italian Air Service. In the present article these ratios have been applied over a range of fairly modern aircraft. It is to be noted that the high power of many modern aeroplanes, whilst possibly giving them a low economical ratio in the tables, give such aeroplanes a wide range of speed.

In making a comparison between the performance of various engines, one important item of the data compared is the weight per horse-power. Thus an engine developing 445 normal b.h.p. and weighing 747 lb. will show a specific weight, or a weight efficiency value, $\frac{747}{445}$, equals 1·68 lb. per b.h.p. Petrol and oil consumption per unit of power are other comparables. These are simple deductions enabling one to arrive at the efficiency of the engine. Similar efficiency ratios, with certain qualifications, may be used for the rapid comparison between aircraft.

Before final comparisons are made by the use of simple ratios such as these, it is necessary to view results in the true perspective by noting the variables which ultimately affect the practical success of any one aeroplane, apart from any efficiency figure determined by ratio value, the latter procedure being a step towards the selection of the best.

In comparing the efficiency of an aeroplane certain desirable features in one type may not be required in another type, or, again, the design may be a compromise so that several features are retained to the best degree possible. Aeroplanes are designed for particular duties and thus possess qualities which are comparable only in relation to the particular work they are called upon to do. As regards speed, a suitable classification may be made in which the single-seater fighters and high-speed day bombers may be grouped as fast types : the general purpose and reconnaissance aeroplanes may then be grouped as medium -speed types and finally the large bombers and freight carriers as low-speed types. Flying boats might conveniently form another group and again these may be sub-divided according to their particular duty and their equipment. The necessity for dividing aircraft into groups on the basis of speed and their duties becomes, therefore, apparent.

Speed of an aeroplane, useful load and the ability to reach high altitude are characteristics which may be examined on the basis of the economical use of power. The speed ratio $\frac{\text{speed}}{\text{h.p.}}$ indicates a value for comparing power economy of an aeroplane in any one group. Similarly, the load relation $\frac{\text{useful load}}{\text{h.p.}}$ expresses an efficiency where the higher the ratio value the more economical is the aeroplane as regards pay load to power. The ceiling relation $\frac{\text{ceiling}}{\text{h.p.}}$ indicates the capacity to climb to altitude with normal unsupercharged engine. With the supercharged engine, where normal ground power of the engine may be maintained at the higher altitudes,

(*Continued on p.* 51.)

TABLE I.—COMPARISON OF AIRCRAFT BY RATIO VALUES

Single Seater Fighters

—	Aircraft	Normal h.p.	Speed at 10,000 ft. Altitude (3,000 m.) km./hr.	Useful Load, kg.	Service Ceiling, m.	Speed Ratio S / H.P.	Power Load Ratio L / H.P.	Climb Ratio C / H.P.
British ..	Grebe	397	237	371	6,705	0·59	0·93	16·8
	Siskin IIIa	400	246	423	8,260	0·61	1·05	20·6
	Gamecock II	470	245	470	7,010	0·52	1·0	15·0
	Hawfinch I	420	275	447	9,296	0·65	1·06	22·1
	Partridge I	420	268	439	8,823	0·61	1·04	21·0
	Bulldog II	414	268	440	9,296	0·69	1·06	22·4
French ..	Nieuport 42	500	249	429	5,913	0·55	0·85	11·8
	„ 29	300	225	340	7,924	0·75	1·13	26·4
	„ 72	500	260	432	9,000	0·52	0·86	18·0
	Dewoitine D.21	500	257	500	9,000	0·51	1·0	18·0
	Wibault 7 C.1	420	231	300	5,670	0·55	0·71	13·5
	Gourdou 32 C.1	420	232	408	6,400	0·55	0·97	15·2
	Bleriot Spad 91	500	260	308	7,500	0·52	0·65	15·0
Italian ..	Fiat C.R.20	410	267	394	8,074	0·65	0·96	19·6
	Macchi 41 (boat)	410	236	430	6,506	0·57	1·04	16·0
Czecho-Slovakia ..	B.H.33	440	265	400	7,985	0·6	0·9	18·0
U.S.A. ..	F 3-W Apache	425	260	290	10,058	0·61	0·68	23·6
	Curtiss Hawk (non-supercharged)	430	249	396	7,000	0·58	0·92	16·2
	Boeing 89	500	*293	363	8,839	0·58	0·72	17·6

* Not confirmed.

TABLE II.—COMPARISON OF AIRCRAFT BY RATIO VALUES

Multi-Seater Reconnaissance.

British ..	Fairey G.P. III F 2-3 seater (all metal)	553	233	760	6,141	0·42	1·37	11·1
	Wapiti II	542	226	780	7,376	0·41	1·43	13·5
French ..	Potez 25 A 2	450	203	780	6,370	0·45	1·73	14·1
	Bleriot 127 M..	2 × 500	208	1,217	5,791	0·2	1·21	5·79
	Breguet 19 A 2	450	196	988	5,669	0·43	2·19	12·59
	Levasseur A M 2	450	200	374	7,162	0·44	0·83	15·9
Italian ..	Fiat R 22	550	230	900	5,998	0·418	1·63	10·91
	A.120	550	—	904	7,178	—	1·64	13·0
	Breda B.A.7	500	222	900	4,998	0·44	1·8	9·9
Czecho Slovakia	B.H.28	480	—	792	6,055	—	1·65	12·6
	S.16	450	—	1,080	6,498	—	2·4	14·44
	A.11 H.S.	300	—	525	6,498	—	1·75	21·6
U.S.A. ..	T.4 M.1 (Martin)	525	—	1,577	3,413	—	3·0	6·5
	Vought Corsair O.2 U ..	425	—	587	6,248	—	1·38	14·7
	Falcon A.3, O.I.B.	425	—	—	—	—	—	—

TABLE III.—COMPARISON OF AIRCRAFT BY RATIO VALUES

Single Engine Bombers

British ..	Horsley	670	193	1,352	5,486	0·28	2·01	8·18
	Fox	460	242	143	5,181	0·52	1·61	11·26
French ..	Breguet 19 B.2	480	201	955	5,547	0·41	1·96	11·1
Italian ..	S.62	500	185	1,102	5,242	0·37	2·2	10·48
	Fiat B.R.1	685	222	1,302	6,096	0·32	1·9	8·9
Czecho Slovakia	S.6	260	161	650	4,175	0·61	2·5	16·0
	S.216	480	214	1,169	5,600	0·44	2·4	11·7

TABLE IV.—COMPARISON OF AIRCRAFT BY RATIO VALUES

Multi-Engine Bombers

British ..	Hyderabad	2 × 470	174	2,362	4,282	0·18	2·5	4·55
	Hinaidi	2 × 500	162	3,092	3,673	0·16	3·09	3·67
French ..	Liore Olivier 20	2 × 420	—	2,506	—	—	2·9	—
	Farman 160	2 × 500	—	2,740	—	—	2·74	—
Italian ..	S.63 (boat)	2 × 510	174	2,309	3,719	0·17	2·34	3·63
	Caproni 73 bis	2 × 450	184	2,300	5,029	0·20	2·5	5·58
U.S.A. ..	T2 D-1	2 × 525	—	2,082	4,709	—	1·9	4·48
	Condor	2 × 600	180	3,300	4,500	0·15	2·75	3·75

TABLE V.—COMPARISONS OF FLYING BOATS BY RATIO VALUES

Note.—Speeds at Sea Level. Service Ceiling is Altitude at which Climb is 100 ft. per minute.

	Aircraft	H.P.	Speed at S.L.		Normal Useful Load		Service Ceiling		Speed Ratio at S.L. $\frac{S}{H.P.}$	Load Ratio (useful) $\frac{L}{H.P.}$	Climb Ratio $\frac{C}{H.P.}$
			M.p.h.	Km./hr.	Lb.	Kg.	Ft.	M.			
British	Southampton (metal)	2×480	108	174	5,279	2,399	14,000	4,270	0·181	2·49	4·44
	Iris	3×670	115	185	9,271	4,418	11,850	3,612	0·09	2·19	1·79
	Singapore	2×650	116	187	6,583	2,992	—	—	0·143	2·30	—
	Calcutta	3×500	120	193	7,702	3,509	12,650	4,000	0·128	2·33	2·66
French	Latham H.B.3	2×400	118	190	4,204	1,911	12,400	3,807	0·237	2·38	4·75
	C.A.M.S.51	2×480	121	195	5,060	2,300	17,384	5,301	0·203	2·39	5·52
Italian	S.55 (Santa Maria)	2×500	127	204	*7,530	3,422	—	—	0·204	*3·42	—
	S.63	2×510	126	203	5,080	2,309	12,300	3,719	0·19	2·34	3·63
U.S.A.	P.N.10	2×500	114	183	*8,934	4,060	4,500	1,372	0·183	*4·06	1·37
	P.N.12	2×525	107	172	6,600	3,000	10,900	3,324	0·163	2·85	3·16
Germany	Wal (B.M.W.)	2×500	118	190	4,180	1,900	15,090	4,600	0·19	1·9	4·6
	Superwal (Jupiter)	4×480	130	209	9,921	4,509	11,500	3,500	0·108	2·34	1·82
	Rocco	2×650	125	201	7,695	3,500	9,185	2,800	0·154	2·7	2·15
	Romar	3×600	129	208	16,500	7,500	9,000	2,740	0·115	4·16	1·5
	D.O.X.	12×500	†135	217	*47,300	21,500	—	—	0·035	*3·58	—

* Maximum useful load for long-distance endurance flights. † Expected.

much higher speeds and altitude may be obtained. Speed is most valuable for Service aeroplanes, especially for the single-seater fighter, but is of less importance to the commercial aeroplane. A high useful load is essential for the commercial aeroplane and desirable in the large bomber. Speed is affected in compromising for any gain in useful load. The day bomber must suffer a reduction in useful load if high speeds are demanded for this type. The single-seater fighter must have high speed and high ceiling. Both of these qualities reduce the useful load and the small fighter aeroplane is thus limited in carrying capacity, which will affect fuel capacity and consequently endurance. Ceiling is not of great importance to commercial aeroplanes.

Tables I to V give the performance data of some of the most important aeroplanes and the speed, useful load, and ceiling ratios are tabulated for rapid comparison. For convenience, three aeroplanes of the respective groups are set down in Tables IA to IVA, which are found to have first, second and third place in accordance with best ratio values. In Table IA, that of the single-seater fighter group, the French Nieuport 29 is first place in speed, useful load and climb. The low horse-power of this machine, as might be expected, is responsible for the higher efficiency ratios. In actual speed, useful load and climb the Nieuport falls much below the British, U.S.A., and Italian single-seater fighters. The Nieuport is comparatively an old machine. In common with the universal demand for speed, the general increase of military equipment and higher operational heights, the modern single-seater fighter necessitates higher powers and the type is not an economical machine as regards the use of power. The British single-seaters occupy a place in the table by reason of high actual speed and useful load with moderate horse-power. In climb they compare with the U.S.A. machines.

In the medium speed group, Table IIA, there is not a great difference in the speed ratios, the French Potez 25 A2 being first. The speed of the Potez is slow at 203 km. per hour, but not as slow as the Breguet 19 A2 with the same horse-power. The British aeroplanes of the medium-speed type find no place in Table IIA, but reference to Table II will show that, with the Italian types, their actual speed and

TABLE IA.—AIRCRAFT IN ORDER OF BEST RATIO VALUES

Single-seater Fighters

	Aircraft.	Speed. Ratio Value.	Normal H.p.	Actual Speed at 10,000 ft.
1	French Nieuport 29	0·75	300	225 km./hr
2	British Bulldog II	0·69	414	268 ,,
3	Italian Fiat CR. 20	0·65	410	267 ,,
	British Hawfinch	0·65	420	275 ,,

	Aircraft.	Useful load. Ratio value.	Normal H.p.	Actual Useful Load.
1	French Nieuport 29	1·13	300	340 kilos.
2	British Bulldog II	1·06	414	440 ,,
	British Hawfinch 1	1·06	420	447 ,,
3	British Siskin IIIA	1·05	400	423 ,,

	Aircraft.	Climb. Ratio Value.	Normal H.p.	Actual Service Ceiling.
1	French Nieuport 29	26·4	300	7,924 m.
2	U.S.A. F.3.W. Apache	23·6	425	10,058 m.
3	British Bulldog II	22·4	414	9,296 m.

TABLE IIA.—AIRCRAFT IN ORDER OF BEST RATIO VALUES

Multi-seater Reconnaissance

	Aircraft.	Speed. Ratio Value.	Normal H.p.	Actual Speed at 10,000 ft.
1	French Potez 25 A2	0·45	450	203 km./hr
2	Italian Breda B A7	0·44	500	222 ,,
	French Levasseur AM2	0·44	450	200 ,,
3	French Breguet 19 A2	0·43	450	196 ,,

	Aircraft.	Useful Load. Ratio Value.	Normal H.p.	Actual Useful Load.
1	U.S.A. Martin T.4.M.1	3·0	525	1,577 kg.
2	Czecho Slovakia S.16	2·4	450	1,080 ,,
3	French Breguet 19 A2	2·19	450	988 ,,

	Aircraft.	Climb. Ratio Value.	Normal H.p.	Actual Service Ceiling.
1	Czecho Slovakia A11 H.S.	21·6	300	6,498 m.
2	Levasseur AM2	15·9	450	7,162 m.
3	U.S.A. Vought Corsair	14·7	425	6,248 m.

TABLE IIIA.—AIRCRAFT IN ORDER OF BEST RATIO VALUES

Single-engine Bombers

	Aircraft.	Speed. Ratio Value.	Normal H.p.	Actual Speed at 10,000 ft.
1	Czecho Slovakian S6	0·61	260	161 km./hr
2	British Fox	0·52	460	242 ,,
3	Czecho Slovakian S216	0·44	480	214 ,,
	Aircraft.	**Useful Load. Ratio Value.**	**Normal H.p.**	**Actual Useful Load.**
1	Czecho Slovakian S6	2·5	260	650 kg.
2	,, ,, S216	2·4	480	1,169 ,,
3	Italian S62	2·2	500	1,102 ,,
	Aircraft.	**Climb Ratio Value.**	**Normal H.p.**	**Actual Service Ceiling.**
1	Czecho Slovakian S.6	16·0	260	4,175 m.
2	,, ,, S.216	11·7	480	5,600 m.
3	British Fox	11·26	460	5,181 m.

TABLE IVA.—AIRCRAFT IN ORDER OF BEST RATIO VALUES

Multi-engine Bombers

	Aircraft.	Speed. Ratio Value.	Normal H.p.	Actual Speed at 10,000 ft.
1	Italian Caproni 73 bis	0·2	2 × 450	184 km./hr
2	British Hyderabad	0·18	2 × 470	174 ,,
3	Italian S.63 boat	0·17	2 × 510	174 ,,
	Aircraft.	**Useful Load. Ratio Value.**	**Normal H.p.**	**Actual Useful Load.**
1	British Hinaidi	3·09	2 × 500	3,092 kg.
2	French Liore Olivier 20	2·9	2 × 420	2,506 ,,
3	French Farman 160	2·74	2 × 500	2,740 ,,
	Aircraft.	**Climb. Ratio Value.**	**Normal H.p.**	**Actual Service Ceiling.**
1	Italian Caproni 73 bis	5·58	2 × 450	5,029 m.
2	British Hyderabad	4·55	2 × 470	4,282 m.
3	U.S.A. T2D1	4·48	2 × 525	4,709 m.

useful load are compatible with the higher power engines, although suffering a slight drop in the efficiency ratios.

Of the single-engine day bomber group, Table IIIA, the Czecho Slovakian Smolik 6 occupies first place in speed, useful load and climb ratios, and like the Nieuport 29 in the single-seat group, this is due to the very low power of 260 h.p. For actual performance, irrespective of the economy factor, the Smolik S216 with 480 h.p. engine shows a much greater increase in actual performance, but the latter machine is surpassed by the speed of the British Fox day bomber. The Fox is easily first in the group for actual speed, with only a slight reduction in the speed ratio value compared with the Smolik 6. In the load ratio the low value 1·61 (Table III) precludes the Fox from inclusion in Table IIIA. From this it is inferred that useful load has been sacrificed for the higher speed. In climb the Fox occupies third place.

In the multi-engine bomber group, Table IVA, speed and climb is easily first with the Italian Caproni 73 bis, both in the economy ratios and actual performance. This is effected by a reduction of useful load or bomb load, which precludes the Caproni from a place in the useful load ratios, the useful load ratio being 2·5 (Table IV) and the same as the British Hyderabad, the latter holding second place in speed and ceiling ratios.

IN THE DRAWING OFFICE.

LEVER GEARING

By R. RODGER

The simple mechanical principle of the lever finds frequent application in the detail design of modern aircraft, particularly in the case of remote-control mechanisms such as flying controls, engine controls, etc. The actual gear may assume different forms, such as cable drums, chain sprockets, plate levers, "bloaters," etc., but the underlying principle of the lever still persists.

The usual method of estimating the required lever arms is to set out the mechanism to as large a scale as possible, indicating all known leverages and movements, such usually constituting the terminal conditions, *e.g.*, at the joystick and the aileron in the case of the aileron controls. Length of arm and/or angular travel are then assumed for the intermediate levers, and the effect of such assumed gearing is obtained by trammelling between pin centres of levers. More often than not several tentative efforts have to be made before a satisfactory solution is arrived at, and the whole method is somewhat undesirable because of its hit-and-miss nature, and the consequent amount of labour involved in producing the desired results.

Except in the case of fairly localised mechanisms it is generally necessary to do the setting out to a considerably restricted scale—one is rather happy if a scale of 3 in. to 1 ft. can be employed—and this fact cannot improve the accuracy of the layout and the subsequent operations with same.

The method described hereafter for determining the gearing of lever mechanisms has been employed by the writer for a number of years now, and has always been found to produce satisfactory and accurate results. Furthermore, no matter how remote the control may be, it is always possible to lay it out full scale, to take measurements directly with a protractor and a rule, and to dispense entirely with the cumbersome beam-compasses. These advantages seem sufficient in themselves to recommend the method as a labour-saving proposition, quite apart from the fact that the diagram provides a ready means of assessing by inspection the possibilities of various combinations of intermediate gearing between the source of control and its objective. This assessment becomes very necessary in the more intricate mechanisms where structural considerations limit to a large extent the choice of leverages.

For the purposes of discussion consider the simple aileron control mechanism shown in diagram form in Fig. 1, the problem being to obtain an aileron movement of ± 22° with a control column movement restricted to 16° either side of neutral. It will be sufficient to consider movement to one side only. Further, consider that structural requirements limit the arms of levers A and B to a maximum of $4\frac{1}{2}$ in. and 4 in., respectively. We shall, of course, endeavour to utilise these maximum arms in order to reduce the mechanical loads in the rods. The problem now remains suitably to proportion levers C and D.

In Fig. 2, draw the rectilinear axes of reference OX and OY. On OX lay off OA = throw of lever A = $4\frac{1}{2}$ in., and with O as centre describe the arc AE. From O draw OF, making angle θ = the semi-angular travel of lever A = 16°. Now OF intersects AE in G. Through intersection G and parallel to OX draw HJ. Then LA = the semi-linear travel of lever A.

On OX lay off OB = throw of lever B = 4 in., and with O as centre describe the arc BK intersecting HJ in M. From O draw ON through M, this line, with reference to the axis OX, representing the travel of the bell crank BC.

From O draw OP making angle ϕ = the semi-angular travel of lever D and, of course, the aileron = 22°. Assume, tentatively, the arm of lever D = $4\frac{1}{2}$, its sweep being represented by arc AE intersecting OP in R. Through R and parallel to OX draw ST intersecting ON in U. Then OU is the required arm of lever C = $5\frac{13}{32}$ in. by direct measurement to give the necessary gearing between control column and aileron as originally called for.

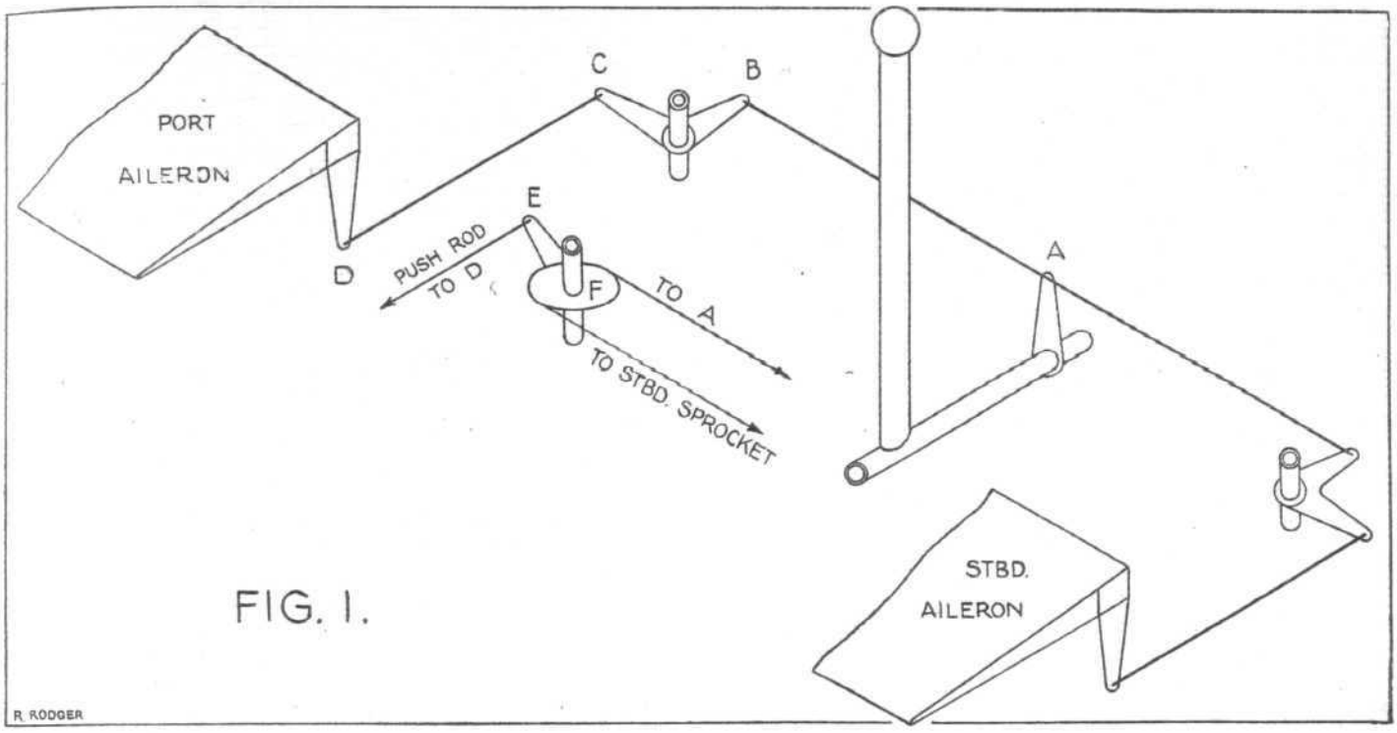


FIG. 1.

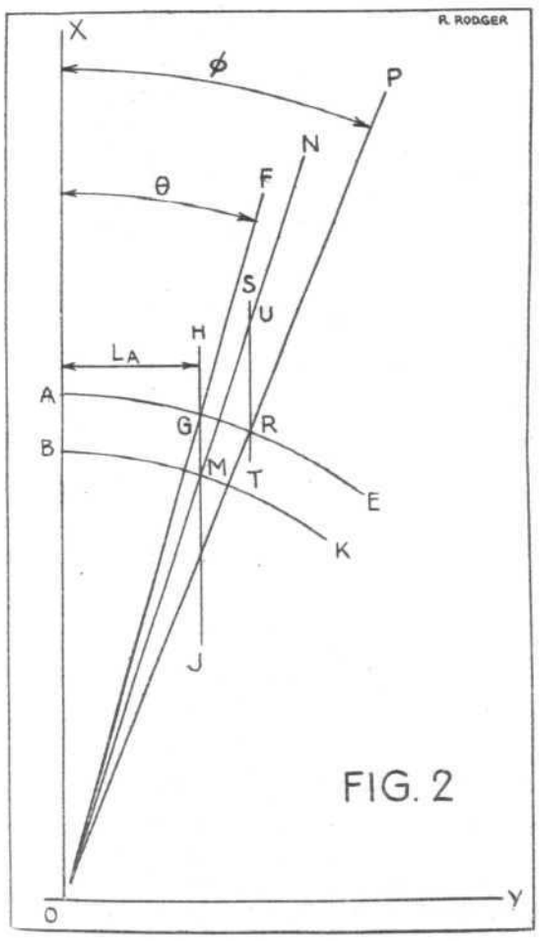


FIG. 2

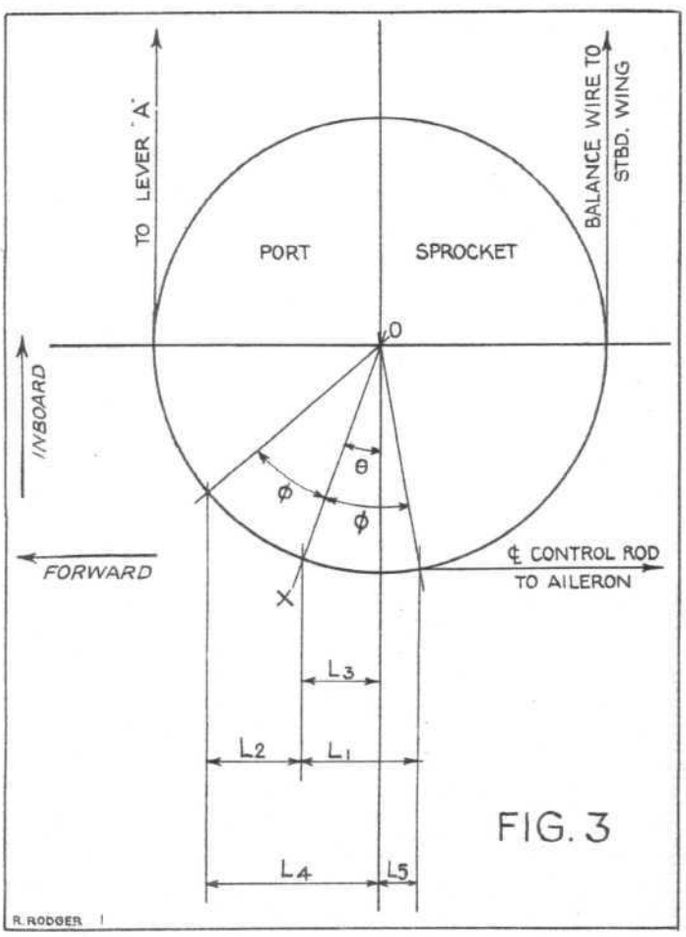


FIG. 3

The example given is a very simple one. Deliberately so in order to clarify as much as possible the explanatory matter outlining the principle of the proposed system of layout. At first sight this explanation may appear to be a little complicated and unwieldy, but once mastered the principle can be applied with facility to the more complex lever mechanisms so often met with in practice. Moreover, this facility will naturally improve with continued application.

The solution for differential lever mechanisms is rather more troublesome, the variable linear travel for different lever arms, angular travels and settings having to be correlated on a common basis, the basis chosen here being the throw of the differential lever itself.

In Fig. 3 is shown a diagrammatic plan of the port sprocket, with the leads therefrom, in a differential aileron control mechanism. The differential lever is represented in the neutral position by OX, the offset angle being θ and the angular travel ϕ each side of the neutral position. The differential gearing is, of course, produced by the variation in the linear travels L_1 and L_2.

Now,

$$L_1 = L_3 + L_5$$

but $L_3 = OX \sin \theta$

and $L_5 = OX \sin (\phi - \theta)$

hence $L_1 = OX [\sin \theta + \sin (\phi - \theta)]$(1)

Also

$$L_2 = L_4 - L_3$$

but

$$L_4 = OX \sin (\phi + \theta)$$

hence

$$L_2 = OX [\sin (\phi + \theta) - \sin \theta] \quad \ldots\ldots\ldots\ldots (2)$$

From formulæ (1) and (2) the linear travels L_1 and L_2 may be expressed in terms of OX—the arm of the differential lever—and those parts of the formulæ included between brackets have here been designated as the positive and negative differential coefficients. The distinction in sign has been made in accordance with the nomenclature of the Advisory Committee for Aeronautics, *i.e.*, "the aileron angle is positive when the starboard aileron is down and the port aileron is up." Hence, in Fig. 3, L_1 is positive and L_2 negative and the corresponding differential coefficients are

$$k_P = \sin \theta + \sin (\phi - \theta) \quad \ldots\ldots\ldots\ldots (3)$$

and

$$k_N = \sin (\phi + \theta) - \sin \theta \quad \ldots\ldots\ldots\ldots (4)$$

These coefficients k_P and k_N are tabulated in Tables I and II, respectively, for a wide range of angular settings and travels, and their application will now be illustrated by assuming that the aileron control mechanism shown in Fig. 1 has to be adapted to differential control, giving an aileron travel of 25° up and 10° down.

TABLE I.

Positive Linear Differential Coefficients, k_P.

Angular setting. θ	Angular Travel. φ 5	10	15	20	25	30	35	40	45	Angular setting. θ
0	087	174	259	342	423	500	574	643	707	0
5	087	174	261	346	429	510	587	661	730	5
10	086	174	261	347	432	516	596	674	747	10
15	085	172	259	346	432	518	601	681	759	15
20	083	168	255	342	429	516	601	684	765	20
25	081	163	249	335	423	510	596	681	765	25
30	077	158	241	326	413	500	587	674	759	30
35	074	151	232	315	400	486	574	661	747	35
40	069	143	220	301	384	469	556	643	730	40
45	064	134	207	284	365	448	533	620	707	45
50	059	123	192	266	343	424	507	592	679	50
55	053	112	176	246	319	397	477	560	646	55
60	047	100	159	223	292	366	443	524	607	60

N.B.—All coefficients are wholly decimal.

TABLE II.

Negative Linear Differential Coefficients, k_N.

Angular setting. θ	Angular Travel. φ 5	10	15	20	25	30	35	40	45	Angular setting. θ
0	087	174	259	342	423	500	574	643	707	0
5	086	172	255	335	413	486	556	620	679	5
10	085	168	249	326	400	469	533	592	646	10
15	083	164	241	315	384	448	507	560	607	15
20	081	158	232	301	365	424	477	524	564	20
25	077	151	220	284	343	396	443	484	517	25
30	074	143	207	266	319	366	406	440	466	30
35	069	134	192	246	292	333	366	392	411	35
40	064	123	176	223	264	297	323	342	353	40
45	059	112	159	199	233	259	278	289	293	45
50	053	100	140	174	200	219	230	234	230	50
55	047	087	121	147	166	177	181	177	166	55
60	040	074	100	119	130	134	130	119	100	60

N.B.—All coefficients are wholly decimal.

Considering the port aileron, the 25° is positive, and the 10° negative, according to the definition quoted above.

For lever D the angular setting is zero. Hence, from Table I, for $\theta = 0°$ and $\phi = 25°$,

$$k_P = 423.$$

Again, from Table II, for $\theta = 0°$ and $\phi = 10°$,

$$k_N = 174.$$

By inspection of Tables I and II we first localise conditions at

$$\left.\begin{array}{l}\theta = 50° \\ \phi = 30° \\ k_P = 424\end{array}\right\} \text{ From Table I.}$$

and,

$$\left.\begin{array}{l}\theta = 55° \\ \phi = 30° \\ k_N = 177\end{array}\right\} \text{From Table II.}$$

observing that the range 177 to 424 is slightly larger than that called for.

Further and closer inspection shows us that the greater variation in k with ϕ occurs for k_P. Therefore, it will probably be better to adjust on k_P.

From Table I, for $\theta = 55°$ and $k_P = 423$, $\phi = 31{\cdot}5°$, by interpolation, call $\phi = 32°$. Likewise, from Table II, for $\theta = 55°$ and $\phi = 32°$, $k_N = 179$, again by interpolation.

Hence, lever E, Fig. 1, must be set-*forward* 55° from the normal to the plane of vibration of lever D, and its angular travel will be 32° each side of this offset neutral position.

Now for the lever arms. Our estimates with k_P and k_N assume that levers D and E are of equal throw, and the problem is considerably simplified by this assumption, as the actual numerical values for the arms do not affect the differential gearing obtained with lever E. A convenient throw for levers D and E would be 6 in.

The diameter of the chain sprocket F is given by the formula,

$$d = \frac{114{\cdot}6\,(L_A \sin \beta)}{\phi} \quad \ldots\ldots\ldots\ldots (5)$$

where,

d = pitch diameter of chain sprocket.
L_A = throw of lever A.
β = semi-angular travel of lever A.

In the specific example taken, $d = 4{\cdot}437$ in. This theoretical value will most probably require slight modification to accommodate an even number of teeth as indicated by the formula

$$d = \frac{P}{\sin\left(\frac{180}{N}\right)} \quad \ldots\ldots\ldots\ldots\ldots (6)$$

where

P = pitch of chain.
N = number of teeth.

The useful chain sprocket data presented in Table III are calculated from formula (6), and applying same to our illustrative example, we obtain the following practical alternatives for the chain sprocket F,

Case I.

Pitch of chain	= ⅜ in.
Sprocket pitch diam. ..	= 4·422 in.
Number of teeth ..	= 37.

Case II.

Pitch of chain	= ½ in.
Sprocket pitch diam. ..	= 4·466 in.
Number of teeth ..	= 28.

One factor arises which so far has received no consideration, namely, the angularity of the push rod. This factor will have the effect of modifying slightly the aileron movements, as calculated so far, but as, for several practical reasons, the angularity of the push rod must be kept small, so also will the modification to the calculated aileron movements be small.

In the first place, levers D and E will be so constructed as to have a large section modulus in the plane of their travel, as compared with the modulus in a plane normal to that in which they vibrate. This means, of course, that they are

TABLE III.

Roller Chain Sprocket Data.

Number of Teeth	Pitch of Chain. Sprocket Pitch Diam.		Number of Teeth.	Pitch of Chain. Sprocket Pitch Diam.	
	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.		$\frac{3}{8}$ in.	$\frac{1}{2}$ in.
	ins.	ins.		ins.	ins.
10	1·214	1·618	26	3·111	4·148
11	1·331	1·775	27	3·230	4·307
12	1·449	1·932	28	3·349	4·466
13	1·567	2·089	29	3·468	4·625
14	1·685	2·247	30	3·588	4·783
15	1·804	2·405	31	3·707	4·942
16	1·922	2·563	32	3·826	5·101
17	2·042	2·721	33	3·945	5·260
18	2·160	2·879	34	4·065	5·419
19	2·279	3·038	35	4·184	5·578
20	2·398	3·196	36	4·303	5·737
21	2·517	3·355	37	4·422	5·896
22	2·636	3·513	38	4·542	6·055
23	2·754	3·672	39	4·661	6·214
24	2.873	3·831	40	4·780	6·373
25	2·992	3·989	41	4·899	6·532

capable of taking but a comparatively small side load in bending. Lever D is particularly affected in this manner, as it is exposed to the air stream, and from considerations of parasite resistance must necessarily be of a good streamline section with a fineness ratio of probably round about 4 to 1.

Secondly, the push rod will require universal terminals, the generally-accepted method nowadays being to fit small-bore self-aligning ball-races in machined plug-end housings. These ball-races are not intended to accommodate large angular displacements, and their manufacturers quite rightly refuse to guarantee smooth and satisfactory operation under such conditions.

In the writer's opinion ± 5° should be the maximum permissible angularity of the push rod. He is aware that higher values are used, but offers the opinion that such is bad practice. The maximum value ever used in his own experience was ± 8°, and this somewhat unwillingly. Only remarkable and unusual structural advantages arising therefrom rendered such a compromise tolerable.

(To be concluded.)

TECHNICAL LITERATURE

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

MECHANICAL PROPERTIES OF PURE MAGNESIUM AND CERTAIN MAGNESIUM ALLOYS IN THE WROUGHT CONDITION (Continued). By S. L. Archbutt, F.I.C., and J. W. Jenkin, Ph.D., B.Sc. Presented by Dr. W. Rosenhain, F.R.S. Work performed at the National Physical Laboratory for the Engineering Research Board of the Department of Scientific and Industrial Research. R. & M. No. 1287. (M. 67.) (16 pages and 5 diagrams.) February, 1929. Price 1*s.* net.

The present report describes work carried out to complete this investigation (previous reports R. & M. 1037,* February, 1928, and R. & M. 1285,† February, 1928), and relates to further tests on wrought magnesium and the 6 per cent. aluminium alloy, and to the production and properties of the two copper alloys included in the programme, namely, 3 per cent. copper and 13 per cent. copper in *magnesium*.

To facilitate comparison of the properties of the four materials systematically investigated, viz., pure magnesium, the 6 per cent. aluminium alloy, the 3 per cent. copper alloy, and one of the proprietary "Electron" alloys, a summary table of typical average results has been prepared and included at the end of this report.

The results of the investigation indicate that the 6 per cent. aluminium alloy possesses the best all-round mechanical properties under the conditions in which the materials have been tested. By controlling the working conditions, relatively good tensile and fatigue properties may be obtained, and the specific tenacity is high.

The 3 per cent. copper alloy is inferior to the other materials in almost every test applied.

The low value obtained for the elastic modulus is a noticeable feature.

The strength of all three materials prepared at the laboratory is very sensitive to rolling conditions, and also falls off rapidly with rise of temperature after a few hours at the testing temperatures.

The general effect of annealing by exposure to 350° C. for 5 hours is a decrease in maximum stress and in elongation.

Prolonged exposure beyond 5 hours up to 100 hours, to a high temperature 350° C., has little further effect on the mechanical properties of the pure metal or the 3 per cent. copper alloy, but with the 6 per cent. aluminium alloy some further decrease in maximum stress and elongation is observed, which is, however, accompanied by a marked increase in energy absorbed on impact.

The 13 per cent. copper alloy presents many difficulties in rolling, and its properties hardly justify its use in the wrought conditions.

* R. & M. 1037. Mechanical properties of pure magnesium and certain magnesium alloys in the wrought condition.—Archbutt and Jenkin.

† R. & M. 1285. Mechanical properties of pure aluminium and certain magnesium alloys in the wrought condition.—Tapsell, Archbutt and Jenkin.

THE ACCELERATIONS OF A FAIREY "FLYCATCHER" SEAPLANE DURING AEROBATIC MANŒUVRES. By L. P. Coombes, B.Sc., and A. S. Crouch, D.I.C., A.C.G.I. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1288. (Ae. 437.) (4 pages and 11 diagrams.) April, 1929. Price 6*d.* net.

As no previous measurements of accelerations on a seaplane during aerobatic manœuvres had previously been made in this country, an opportunity was taken, when the High Speed Flight was stationed at Felixstowe, of measuring such accelerations on a Fairey "Flycatcher."

An instrument, recording both acceleration and air speed, was fitted as close to the centre of gravity of the aircraft as possible. Flights were made by two skilful pilots, and each manœuvre performed several times. In addition, the accelerations during one particular manœuvre, performed by a pilot unaccustomed to aerobatic manœuvres, were also measured.

The range of acceleration recorded in a number of aerobatic manœuvres correctly performed was − 1·8 g. to + 3·6 g. Those values may be exceeded considerably by inexperienced pilots. The manœuvres carried out did not include spins, which will form the subject of a separate report.

TESTS OF MODELS OF HIGH-SPEED SEAPLANES FOR THE SCHNEIDER TROPHY CONTEST OF 1927.—SECTION I. By W. L. Cowley, A.R.C.S., D.I.C., and R. Warden, Ph.D., M.Eng. R. & M. No. 1296. (Ae. 430.) (62 pages and 46 diagrams.) November, 1927. Price 4*s.* net.

Towards the end of 1925, the Air Ministry made a request for tests to be carried out in the Duplex tunnel on a quarter-scale model of a high-speed seaplane, in order to obtain the necessary data for estimating the performance of the machine. The seaplane, the S.5, was designed and constructed by the Supermarine Aviation Company for the Schneider Trophy Contest of 1926. An extensive programme of tests was put forward and work commenced early in March, 1926. While these tests were in progress the Air Ministry decided not to enter British machines for the contests of that year, but the work was continued because the Air Ministry wished to concentrate on the development of high-speed aircraft.

The S.5 seaplane was a monoplane fitted with a water-cooled engine, the Napier "Lion." It was evolved from the S.4 seaplane, which was entered for the competition in the previous year. Several advancements had been made in the design, the chief being the adoption of wing surface radiators for water cooling, and a general improvement in both the bracing system and the shape of the machine. The new "Lion" engine had a much higher power and speed than the engine used on the S.4, and the accessories were arranged so as to reduce the frontal area to a minimum.

Tests were made at wind speeds up to 100 ft./sec. on three complete models. Lifts, drags and pitching moments were measured over the full flying range of angle of attack. Yawing moments were also taken for various angles of yaw, pitch and rudder settings. The tests on the complete model included the effect of tail plane settings on pitching moment and the measurement of rolling moments for various angles of the allerons.

The principal components, wings, bodies, floats and struts were tested separately and in various combinations to determine the relative contributions of the various parts to the drag, the interference between parts, and the most promising field for obtaining a reduction in drag.

A comparison with full-scale tests will be found in R. & M. 1299.*

* Tests on quarter scale models of high-speed seaplanes for the Schneider Trophy Contest of 1927. Section IV.—Comparison with full scale and conclusions.—W. L. Cowley, A.R.C.Sc., D.I.C., and R. Warden, Ph.D., M.Eng.

TESTS OF MODELS OF HIGH-SPEED SEAPLANES FOR THE SCHNEIDER TROPHY CONTEST OF 1927. SECTION II.—TESTS ON THE GLOSTER IV MODELS. By W. L. Cowley, A.R.C.Sc., D.I.C., and R. Warden, Ph.D., M.Eng. R. & M. No. 1297. (Ae. 431.) (48 pages and 48 diagrams.) February, 1928. Price 3*s.* 6*d.* net.

At the request of the Air Ministry tests on quarter-scale models of high-speed seaplanes were carried out in the Duplex wind tunnel, in order to obtain data for design and for estimating the performance of the machines. The seaplanes were ultimately used for the contest of 1927. Three types of machines were designed: a water-cooled engined monoplane, the S.5; a water-cooled engined biplane, the Gloster IV; and an air-cooled engined monoplane, the Crusader. The report is divided into four sections:—

Section I.—Supermarine S.5 Models. R. & M. 1296.
Section II.—Gloster IV Models. R. & M. 1297.
Section III.—Crusader Models. R. & M. 1298.
Section IV.—Conclusions and comparisons with Full Scale. R. & M. 1299.

The present report (Section II) deals with the Gloster IV models.

Four complete models were tested in this section. They were all biplanes, but two only, viz., the first and third models, were made from designs for the Schneider Trophy contest. Of the others, the second model was a landplane suggested as a result of the very high lift found on the first model, but otherwise similar to Model No. 1. The fourth model was a seaplane but differing from the other models mainly in that the upper wings were not blended into the engine fairings of the body. The tests on this model were made chiefly to obtain data to explain the cause of the high maximum lift found on the previous models.

Tests were made at wind speeds up to 100 ft./sec. on four complete models. Lift, drags and pitching moments were measured over the full flying range of angle of attack. Yawing moments were also taken for various angles of yaw, pitch and rudder settings. The tests on the complete model included the effect of tail plane settings on pitching moment.

The principal components, wings, bodies, floats and struts, were tested separately and in various combinations to determine the relative contributions of the various parts to the drag, the interference between the parts, and the most promising field for obtaining a reduction in drag.

TESTS ON MODELS OF HIGH-SPEED SEAPLANES FOR THE SCHNEIDER TROPHY CONTEST OF 1927. SECTION III.—TESTS ON THE CRUSADER MODELS. By W. L. Cowley, A.R.C.Sc., D.I.C., and R. Warden, Ph.D., M.Eng. R. & M. No. 1298. (Ae. 432.) (35 pages and 26 diagrams.) September, 1928. Price 2*s.* 6*d.* net.

At the request of the Air Ministry, tests on quarter scale models of high-speed seaplanes were carried out in the Duplex wind tunnel, in order to obtain data for design and for estimating the performance of the machines. The seaplanes were required in the first place for the Schneider Trophy Contest of 1926, but on account of lack of time were ultimately used for the Contest of 1927.

The present report deals with the Crusader models.

Two complete models of the Crusader were tested. They differed only in the bracing system and in the size of the wings. The first design contained more struts and wires than the second and the wing area was greater. The bracing wires were not included in the first model, but the complete bracing system was incorporated in second model.

Tests were made at wind speeds up to 100 ft./sec. on two complete models of the Crusader. Lifts, drags and pitching moments were measured over the full flying range of angle of attack. Yawing moments were also taken for various angles of yaw, pitch and rudder settings. The tests on the complete model included the effect of tail plane and elevator settings on pitching moments.

The principal components, wings, bodies and floats were tested separately and in various combinations to determine the relative contribution of the various parts to the drag, the interference between parts, and the most promising field for obtaining a reduction in drag. A few subsidiary tests were made, such as an investigation upon the flow of air through the intake of the engine which gave trouble on account, it is believed, of peculiarites of flow round the intake.

A general comparison of all the work on the models of seaplanes designed for this contest will be found in R. & M. 1299.*

* Tests on quarter scale models of high-speed seaplanes for the Schneider Trophy Contest of 1927. Section IV.—Comparison with Full Scale and Conclusions.—W. L. Cowley, A.R.C.Sc., D.I.C., and R. Warden, Ph.D., M.Eng.

TESTS ON QUARTER SCALE MODELS OF HIGH-SPEED SEAPLANES FOR THE SCHNEIDER TROPHY CONTEST OF 1927. SECTION IV.—COMPARISON WITH FULL SCALE AND CONCLUSIONS. By W. L. Cowley, A.R.C.Sc., D.I.C., and R. Warden, Ph.D., M.Eng. R. & M. No. 1299. (Ae. 433.) (32 pages and 13 diagrams.) October, 1929. Price 1*s.* 9*d.* net.

At the request of the Air Ministry, tests on quarter scale models of high-speed seaplanes were carried out in the Duplex wind tunnel, in order to obtain data for design and for estimating the performance of the machines. The seaplanes were required in the first place for the Schneider Trophy Contest of 1927. Three types of machines were designed: a water-cooled engined monoplane, the S.5; a water-cooled engined biplane, the Gloster IV; and an air-cooled engined monoplane, the Crusader. The report is divided into four sections:—

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Section III.—Crusader Model. R. & M. 1298.
Section IV.—Conclusions and Comparisons with Full Scale. R. & M. 1299.

The present report deals with conclusions and comparisons with full scale.

As far as it is possible to determine from the limited full-scale data available it would appear that the model results give fairly good agreement with full scale. In the comparison, however, an estimate has to be made for scale effect between the model and full scale values of Reynolds numbers. This is admitted to be uncertain, but it is considered that the allowance made in the report is reasonable. The falling off of drag coefficient with Reynolds number was found to be less on the models, both complete models and models of machine parts alone, than is usually assumed to exist on skin friction. In addition to the agreement that is believed to exist on speed estimation, it is considered that other results having direct application, such as tail settings for trimming, all point to good agreement between model and full scale.

Comparisons between the results for similar parts have been made, but it is difficult in some cases to know which part to assign the credit of being the best design, because the part has to fulfil more than one condition.

EXPERIMENTAL COMPARISON BETWEEN A SERIES OF TURNS OF DIFFERENT DIAMETER ON A GLOSTER IV SEAPLANE. By J. K. Hardy, B.A., with an Appendix by W. G. Jennings, B.Sc. Presented by the Director of Scientific Research Air Ministry. R. & M. No. 1301. (Ae. 435.) (6 pages and 8 diagrams.) November, 1929. Price 6*d.* net.

The form of turn, which should be adopted so that the least time be lost in a race round a closed circuit, was made the subject of a theoretical investigation prior to the Schneider Trophy Race in 1927.

The results of this investigation, which are published in R. & M. 1288*, were based on assumed aeroplane and engine characteristics; no quantitative tests were ever carried out on high-speed seaplanes to confirm the general conclusions of that Report. The question of turning was again raised by the 1929 Team during the period of practice, and it was decided to settle the matter by direct measurement if possible.

A series of records, both of air speed and of normal acceleration, have been taken for a number of turns in the horizontal plane of different diameter. From these, the track of each has been drawn, and the results compared on a uniform basis.

The time lost steadily decreases with decreasing diameter of turn. The most efficient type of turn, therefore, is the tightest which can be performed in practice. It is estimated that the time lost in turning in the 1929 Schneider Trophy Race was 2½ per cent. for the S.5 and 3½ per cent. for the S.6, assuming an accelerometer reading rising to between 5½ and 6*g*.

The experiments confirm the conclusions of R. & M. 1288.

* R. & M. 1288. "Cornering" at high speeds.—W. G. Jennings.

ON THE EFFECT OF ALTITUDE UPON THE DISTANCE REQUIRED FOR AN AIRCRAFT TO TAKE OFF AND CLIMB 20 METRES, GIVING GENERALISED CURVES OF WEIGHT REDUCTION NECESSARY IF A GIVEN AIRCRAFT IS TO COMPLY WITH THE REQUIREMENTS OF A.P. 1208 UNDER ADVERSE ATMOSPHERIC CONDITIONS. By K. T. Spencer, B.Sc., A.M.I.C.E., Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1307. (Ae. 447.) (7 pages and 5 diagrams.) October, 1929. Price 6*d.* net.

The taking-off requirements for civil aircraft are given in Design Leaflet F.1 of A.P. 1208—Airworthiness Handbook for Civil Aircraft. A maximum horizontal distance is specified in which the aircraft must take-off and clear an obstacle of 20 metres, this distance being 546 yards, 656 yards, or 820 yards, according to the category of the aircraft. In paragraph 6 of this leaflet, it is stated that when it is known that an aircraft is to operate in atmospheric conditions differing considerably from the British conditions it is advisable for the applicant to apply for a Certificate of Airworthiness under the adverse conditions, or alternatively, it is for the users of the aircraft to ascertain the reduction in load necessary to enable the normal requirements to be fulfilled.

This report presents generalised curves from which a rapid estimate can be made of the amount by which the total weight of an aircraft must be reduced when it has to be flown from an aerodrome under adverse atmospheric conditions, *e.g.*, at height or in the tropics. It is assumed that the distance to take off and climb 20 metres under standard ground level conditions has already been determined during the official flight trials for a Certificate of Airworthiness. Starting from this figure and from the horse-power loading of the aircraft at the time the official flight trials were carried out, the maximum permissible total weight at which the aircraft may take off under tropical conditions can be obtained from the curves given. If, in any case, the measured value of get-off run at ground level is not available, the curves can be used to give an approximate figure for weight reduction at height if the stalling speed is known.

STRESSES IN WING STRUCTURES. ACCELEROMETER AND INCIDENCE MEASUREMENTS IN VARIOUS MANŒUVRES. By S. Scott-Hall, M.Sc., D.I.C. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1309. (Ae. 449.) (6 pages and 10 diagrams.) December, 1928. Price 9*d.* net.

One method of improving the lateral stability of aeroplanes at the stall is to provide slots in front of the ailerons. These slots may either be fixed permanently open or may open only in the neighbourhood of stalling, as in the Handley-Page autoslot. The effect of slots in front of a wing is to continue the lift curve of the unslotted wing to a higher maximum value, obtained at an angle of incidence of about 6 deg. to 10 deg. higher than that at which the maximum lift of the unslotted wing is reached. The effect of the increased lift on the wing tips, obtained by the use of the slots at angles of incidence beyond the stall of the unslotted wing, is to alter the load distribution along the span very considerably from that of a normal wing, and to increase the stresses at a given load factor. It is therefore important to determine whether it is possible to obtain large normal accelerations at large angles of incidence on highly manœuvrable aeroplanes of the single-seater fighter type.

Tests were accordingly carried out to investigate the conditions arising during severe handling of a single seater fighter aircraft with the object of ascertaining whether the fitting of automatic wing tip slots to the existing wing structure of this type of aeroplane would be likely to produce dangerous stresses during violent manœuvres. A Nieuport "Nighthawk" was flown by several pilots who carried out rolls, stalled turns, and sharp pulling out from dives at high speed. Measurements of incidence and normal acceleration were made during these manœuvres. The airspeed was also measured approximately.

From the results of the tests it appears that the fitting of automatic slots should not produce dangerous stresses in the wing structure, since the maximum accelerations were recorded at angles below the stall of the unslotted aeroplane. An accelerometer record of 6 g. with corresponding incidence of 12 deg. in pulling out from a dive, 5·5 g. with mean incidence 13 deg. in a roll, and 4·5 g. with incidence 15 deg. in a stalled turn, are the worst conditions that occurred.

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GLIDING

THE KENT GLIDING CLUB.—The club had a stand at the Kent County Agricultural Show at Folkestone on July 17, 18 and 19. The Zögling Glider, which was made by club members, and was the first machine of this type to be flown in England, was on show, and proved a source of great interest to the numerous visitors, many of whom were enrolled as new members.

Repeated requests were made by visitors for a demonstration of gliding from the well-known local hill, Cæsars Camp. Unfortunately, it was not possible to attempt this flight until late in the evening of the closing day of the show. However, with the kind assistance of members of the Channel Gliding Club and a Trojan tractor, the machine was carried and hauled bodily from the show ground to the extreme summit of Cæsars Camp. Mr. C. H. Lowe Wylde, in the machine, was catapulted off shortly after 8 p.m. Those who had walked to the hill were amply rewarded for their pains by witnessing a really fine glide, which was fraught with thrills. It seemed impossible for the glider to make a landing without encountering some obstruction, but Mr. Lowe Wylde, with his usual skill, made a perfect landing in one of the few possible landing fields.

On Sunday, July 20, gliding conditions at Lenham, where the club's training site is situated, were excellent. Many really good glides were made. One flight, which was made by Mr. T. L. Green, was particularly noteworthy, as he succeeded in crossing the Pilgrims' Way, at the foot of the club's site, and made a good landing in the adjoining field. This flight earned him his " A " gliding certificate.

LONDON GLIDING CLUB.—On Saturday, July 19, owing to the gusty wind, instruction was suspended. Those present therefore unpacked and assembled the two-seater " Poppenhausen " machine, which had just arrived from Germany. This machine, which is of the " Hangwind " type, was first tested by Capt. Needham, " solo," on level ground, and then with a passenger. The machine was then taken gradually higher and higher up the slope, and flights of 3 min. duration with passengers were made.

Dual control, though fitted, was not used.

On Sunday, instruction with the Zögling machine commenced in somewhat undesirable weather at 11.30 a.m., and Mr. Ashwell-Cooke then qualified for his " A " glider pilot's licence. Capt. Needham took several members for joy rides in the " Poppenhausen." Owing to a heavy rain storm, gliding was discontinued at 5.30 p.m.

There are still a few vancancies for the Gliding Camp, and those interested should communicate with the Camp Secretary, Mr. G. Grice, Luton Road, Dunstable.

HERTS AND ESSEX GLIDING CLUB.— The above club has been formed and the opening meeting was held near Bishop's Stortford on Sunday, July 6. The club captain, who has experience of flying power-driven aircraft, made six excellent flights.

Altogether about 46 attempts were made. Particulars of the club may be obtained from C. F. Baker, 110, Dunmow Road, or A. Dixey Gerrans, Collins Cross Motor Co.

MERTHYR AND DISTRICT GLIDING CLUB has now been formed at Merthyr Tydfil and members can be enrolled at present at a subscription of £1 1*s*. This will be increased shortly, so intending members should make enquiries at once. A training machine is on order and delivery is expected shortly. Conditions in the district are ideal and a large number have already joined. The Hon. Secretary is C. L. Wills, " Ingleside," The Walk, Merthyr Tydfil.

THE RHÖN COMPETITION.—It has been found that members of the B.G.A. do not wish for inclusive terms, so arrangements have only been made for cheap fares.

For a party of 25 or over, the return fare—second-class train, first-class boat, all meals on the journey, and reserved seats London via Ostend to Fulda—is £6 13*s*. 6*d*. return. The fare from Fulda to Gersfeld is 1*s*. 8*d*.

Hotel accommodation at Gersfeld (which is about two miles from the Wasserkuppe) is from 6 marks per day.

This is an international competition, and, it is hoped, Britain will be represented.

This will give an opportunity to see sail-plane flights by all the various competing German clubs, most of which build their own machines. The starting date is August 7.

THE BRITISH GLIDING ASSOCIATION.—Mr. Howard-Flanders has resigned his post as Secretary of the British Gliding Association and has been co-opted Member of Council. He will continue to edit the Journal.

H.R.H. THE PRINCE OF WALES has for some time expressed a keen desire to see Herr Kronfeld's exhibitions of Soaring Flight, and has tried to attend one of the public demonstrations. Unfortunately, his engagements have prevented this. The B.G.A. therefore arranged to give him a private demonstration at Ivinghoe Beacon, as being the most convenient site, and arrangements were made for a demonstration to be given on Tuesday, July 15.

His Royal Highness was flown down to Ivinghoe Beacon, landing on the field at the bottom of the Beacon, the machine being piloted by Flt.-Lieut. Armour. Here he was met by Col. the Master of Sempill, Sir Sefton Brancker, who had flown down, and Air Comm. Bonham-Carter. Accompanying the Prince of Wales was Lord Louis Mountbatten. The Prince proceeded to another field at the bottom of the Beacon, and there had presented to him Herr Kronfeld, Mr. Gordon England, Capt. Latimer Needham, Mr. Ashwell-Cooke, and the members of the London Gliding Club, who were to act as a launching team. A demonstration was then given by Capt. Needham on the Zögling, and Flt.-Lt. Armour made his first flight. His Royal Highness was so enthusiastic and interested that he asked Sir Sefton Brancker to lend his machine and pilot for the purpose of going over to Hendon Aerodrome and fetching Prince George, whom, the Prince felt, would be equally interested to see the gliding.

Flt.-Lieut. Armour was then launched for his " A " certificate and made a well-judged flight of 48 secs. Shortly after this, Prince George arrived, and Herr Kronfeld took up a Prüfling, and although there was not sufficient wind for soaring, gave a pretty exhibition, gradually losing height, but landing on the side of the Beacon. Flt.-Lieut. Armour was then sent off on the Prüfling to make his first flight on that machine. He finally landed in a field at the bottom of the Beacon, after having been in the air for 83 secs. Then Herr Kronfeld took up his " Wien." The wind being only just sufficient to enable him to soar, and for several minutes he had a very hard struggle to keep his altitude. As he flew backwards and forwards along the face of the Beacon, struggling to gain height, he carried on a conversation with the Prince of Wales. Presently Herr Kronfeld was able to pick up an area of ascending current which enabled him to gain considerable height, and he made an impressive flight of 20 min. landing from where he took off.

Capt. Needham then made a flight from the top of the Beacon for Prince George, who had missed that part of the performance.

THE LEICESTERSHIRE GLIDER CLUB.—When the Leicestershire Glider Club met at their Leicester headquarters, the Turkey Cafe, on Tuesday, July 15, at 8 p.m., the business on hand was the acceptance of the rules drawn up by the Drafting Committee.

In the course of the discussion it was noted by the chairman, Mr. H. D. Hull, that his appointment as technician would more than fully occupy his time at the flying meetings. He is engaged in the construction of gliders, and, feeling himself more fitted to carry out the duty of technician, he offered his resignation as chairman.

Mr. Ernest A. Goodman was elected to the chair and again the case of double offices occurred as Mr. Goodman had previously officiated as captain. On his resignation Mr. Laurie Bates was promoted to the captaincy.

Later, when the members become more proficient, the club will revert to the Billesdon ground for advanced training from a hill, which has been regarded as most suitable for sailplaning, an opinion endorsed by several of the leaders of English gliding who have viisted the spot.

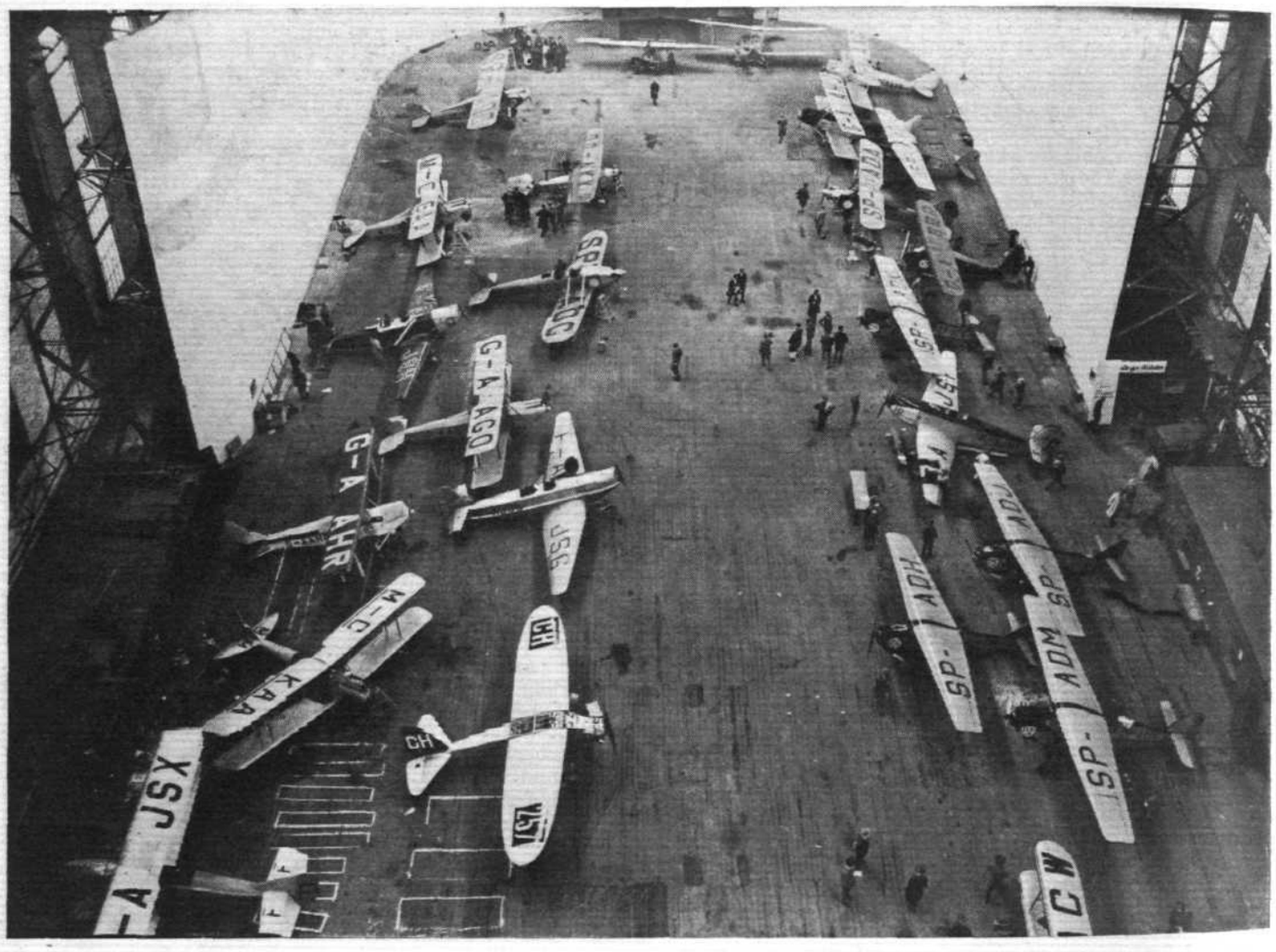
THE DUCHESS OF BEDFORD has kindly consented to become patron of the Bedford Gliding Club.

THE KILMARNOCK GLIDING CLUB has recently been formed, and their first general meeting was held on Monday, July 7. They have decided to purchase a complete glider as a start, and then to construct another for themselves during the winter months. This seems an admirable scheme, and should sustain the interest in the club when the weather prohibits gliding. Those who desire any further information, or are interested in the club, should apply to Mr. Sinclair, 7, Low Glencairn Street, Kilmarnock.

INTERNATIONAL TOURING COMPETITION

60 Machines Start on 4,700 Miles' Tour

OUT of the 97 machines entered for the International Touring Competition, 60 were ready for inspection, weighing, etc., at Staaken Aerodrome, Berlin, at 12 noon on Friday, July 18, and were, consequently, eligible for the official start from Tempelhofer Feld, Berlin, on Sunday morning, July 20. All sixty, in 12 groups of 5 each at 4 m. intervals, started, although some retired from one cause or another before they had covered very many stages of the flight around Europe. Following is a list of the 60 starters, the first letters being the competition identification letters followed by the aircraft type which carries the letters. A complete list of entries was published in FLIGHT of June 6, 1930, to which readers are referred for further information.



THE INTERNATIONAL TOURING COMPETITION: At Staaken Aerodrome, Berlin, on Friday last. Some of the foreign competitors in the Zeppelin Hangar.

Germany (30 Machines)

A2, Klemm L.26 V; A8, Junkers "Junior"; A9, Junkers "Junior"; B3, B.F.W. M.23c; B4, Arado L.2a; B5, Albatros L.101; B7, Klemm L.25a; B8, Klemm L.25e; B9, Klemm L.25e; C1, Klemm L.25e; C3, BFW 23c; C4, BFW M.23c; C5, BFW M.23c; C6, BFW M.23c; C7, BFW M.23c; C8, Arado L.2a; C9, Arado L.2a; D1, Arado L.2a; D2, Albatros L.100; D4, Darmstadt D.18; D5, Klemm 25 IVa; D7, Klemm L.25 1a; D8, BFW M.23b; E1, Klemm; E2, Junkers "Junior"; E6, Klemm L.26; E8, BFW M.23c; E9, BFW M.23c; F1, BFW M.23c; F2, BFW M.23c.

Poland (12 Machines)

O1, P.Z. L5; O2, P.Z. L5; O5, PWS 8; O6, PWS 50; O8, PWS 52; O9, RWD 4; P1, RWD 4; P2, RWD 4; P3, RWD 2; P4, RWD 2; P5, RWD 2; P7, PWS 51.

England (7 Machines)

K1, Avian-Cirrus; K3, Gipsy-Moth; K4, Spartan "Arrow Gipsy"; K5, Gipsy-Moth; K6, Gipsy-Moth; K7, Warner-Monospecial; K8, Gipsy-Moth.

France (6 Machines)

L2, St. Hubert (Belgian); L1, Mauboussin; L3, Caudron 193; M1, Caudron; M2, Caudron 193; M6, Caudron C.232.

Spain (3 Machines)

T1, S.A.S.A.; T5, Gipsy-Moth; T7, Gipsy-Moth.

Switzerland (2 Machines)

S1, Breda 15S; S2, Klemm L.25.

The weather on Sunday was far from favourable, and strong headwinds were encountered by the competitors. It had been thought that some of the faster machines might reach Bristol Aerodrome by Sunday evening, but this was not to be, and no one got across the Channel on Sunday. On Monday morning the weather was no better, and all the competitors who had reached St. Inglevert (the Calais aerodrome) had to kick their heels there for hours, waiting for the weather to clear enough to make a crossing of the Channel reasonably safe. The first competitors to reach St. Inglevert on Sunday were Capt. Broad, Mr. Thorn and Mr. Butler. As might have been expected, certain sections of the Daily Press are quite unable to grasp the fact that this tour of Europe is not a "race," and their great glee when they discovered that three British pilots were leading was therefore somewhat beside the point, although getting around

Europe in the shortest time does have the advantage that full marks for speed may be gained.

It seems well here to point out that provided a machine averages 108·7 m.p.h. in the circuit of Europe, it will be awarded the maximum points for speed, *i.e.*, 195. To this extent, therefore, a fairly high cruising speed is of benefit. The fact that it is flying time and not lapsed time which is used in calculating the speed for the course means that to be held up by weather at a control is not a serious matter unless the delay is so long as to prevent the machine from completing the course in time. Flying time is based on times of arrival and departure at controls, and these times are reckoned at the moment when the log book is signed by an official. Consequently there is a scramble to get out of the machines when arriving at controls, and to get to the officials as quickly as possible. At Heston this led to some skids on the wet aerodrome, several competitors in their eagerness sitting down heavily, and one at least handing his log book to Mr. Perrin from a reclining position.

Heston on Monday and Tuesday was a scene of quiet efficiency as regards the arrangements made for handling the traffic of the International Touring Competition. The bad weather in the Channel held up a large number at St. Inglevert on Monday, so that it was past 3 p.m. before the first man reached Heston.

This was, appropriately enough, Mr. Alan Butler, in his King's Cup special Moth, and he was followed, after a short interval, by Messrs. Thorn and Carberry.

Mr. Thorn delayed a very short time and left again directly he was through the various inspections required by the rules. Thus, he was first away and was later reported to have been the first to arrive in Paris.

The various machines then came in in twos and threes, until about 6.30 p.m., after which there was a lull.

Seven machines, stayed the night at Heston and these were Herr Lusser in a Klemm, Herr Notz also in a Klemm, Herr Neininger in the Darmstadt D18, Herr Benz and Fr. Siebel, both in Klemm's, Capt. Broad in his last year's Moth, but now fitted with a Gipsy II, and Mr. Carberry in his American Mono Special. All these got away shortly after 7 a.m. on Tuesday morning.

On Monday night only one machine stayed the night at Bristol and this was Herr Kruger in a BFW. He arrived at Heston between 9 and 10 a.m., on Tuesday. After he arrived there was a short wait until some of the 21 machines which had been reported to have left St. Inglevert that morning, arrived. This they did from about 10.30 onwards. Altogether, 31 machines passed through Heston on Monday and a further 21 were accounted for there on Tuesday up to 3.30 p.m., thus leaving only 8 out of the original 60 starters still to come up to that time.



THE INTERNATIONAL TOURING COMPETITION: Machines at Tempelhofer Feld on the Sunday Morning before the Start.

It was very gratifying to hear many of the competitors express their extreme thanks for the way things had been arranged for their comfort at Heston and they said that they wished things were the same at the other controls.

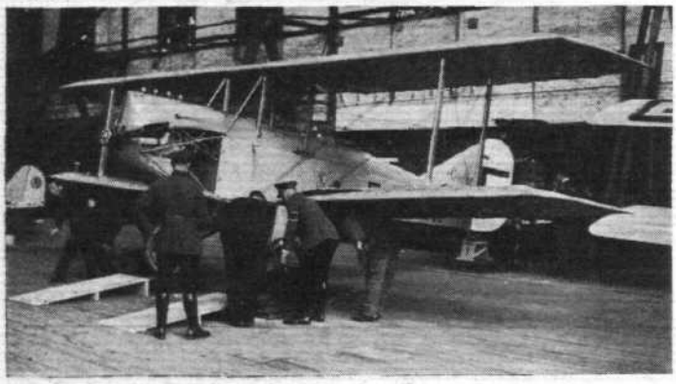
Coffee and sandwiches were brought out to each machine as it arrived and the inspection was expeditiously carried through, so that those who wished to carry on as soon as possible had no cause to complain of any undue delays.

The machines themselves were of absorbing interest, and many new types were to be seen. In view of this fact it was rather surprising that so few of our aeronautical people were to be seen there during the two days. Such little items as enumerated below were all the subjects of interest to those who did turn up.

09 an RWD4 (Hermes) flown by F. Zwirko had a complete Puss Moth undercarriage. This machine had the misfortune to run into a petrol lorry on Monday, and was excellently repaired by Airwork, Ltd., by the next day. The repairs necessitated a new wing tip and a complete new side panel to the fuselage. This was done and neatly painted up in almost the exact colours of the original machine. When the crash was imminent and certain, Mr. Norman (of Airwork)

(*Concluded on page* 854.)

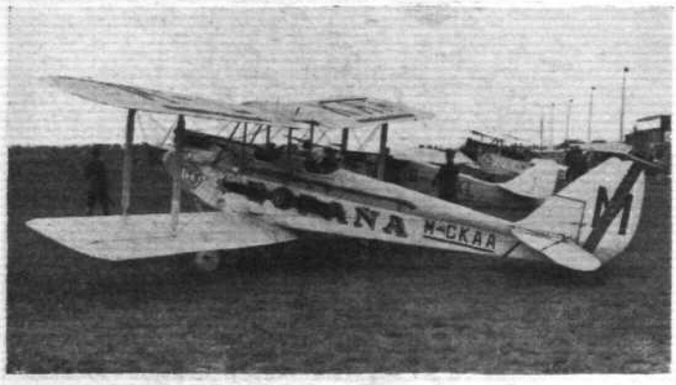
THE START FROM BERLIN



ONE OF THE CAUDRON BIPLANES BEING WEIGHED: This particular machine is fitted with a Renault engine.



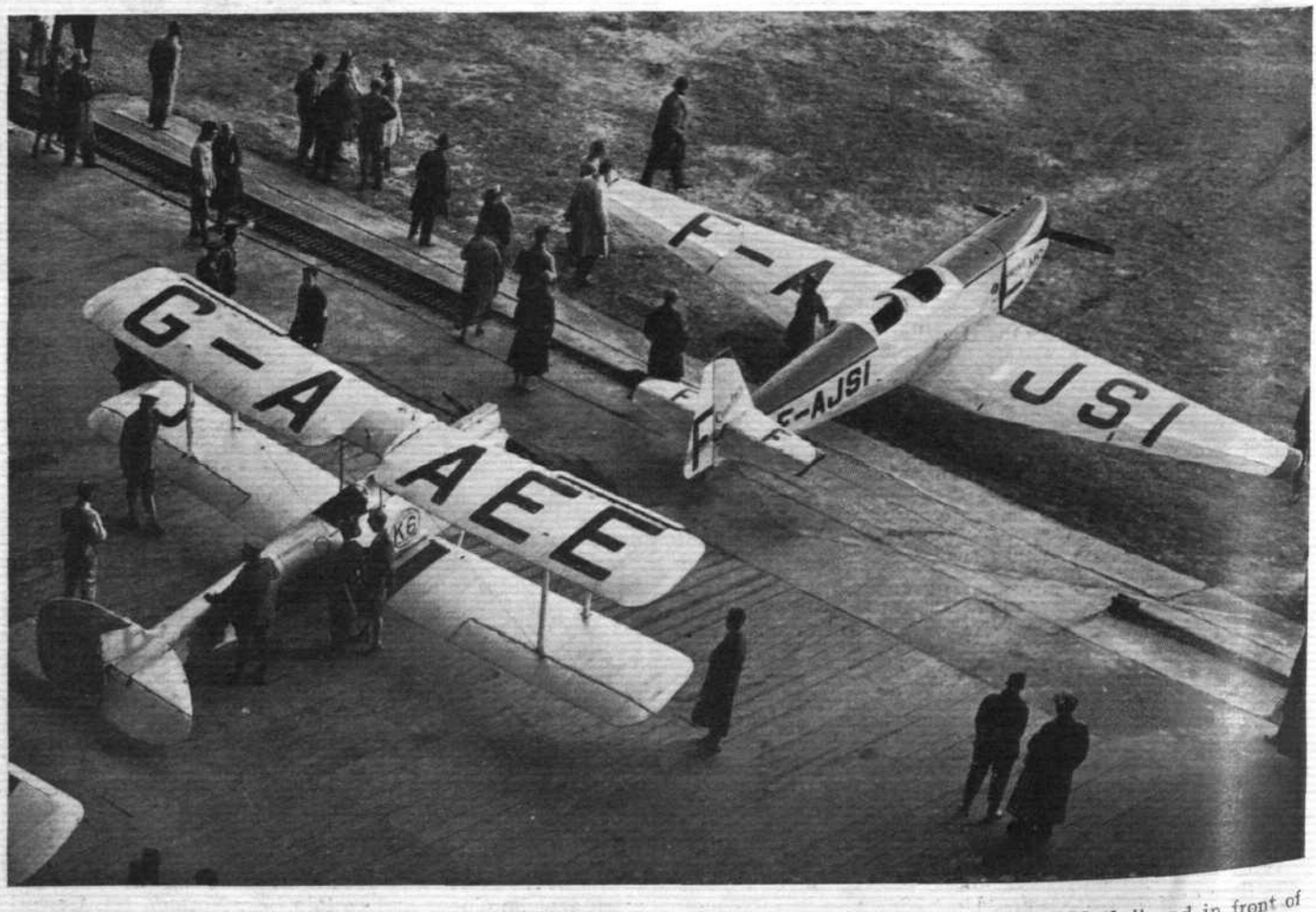
THE BELGIAN REPRESENTATIVE: M. Maus with his St. Hubert Monoplane. The engine of this machine is a 110-h.p. Walter (Czech.).



A SPANISH "MOTH": The machine nearest the camera is that of the Archduke of Hapsburg-Bourbon. Note the spare propeller tied on the side of the fuselage.



A SWISS COMPETITOR: This Klemm monoplane with inverted Argus engine has been entered and is being piloted by Herr Charles Kolp. Note that it has a coupé roof built over cockpits.



AN ANGLO-FRENCH ENTENTE AT BERLIN: In the foreground, Lady Bailey's Gipsy-"Moth," and in front of that M. Finat's Caudron monoplane. The latter is fitted with Renault engine.



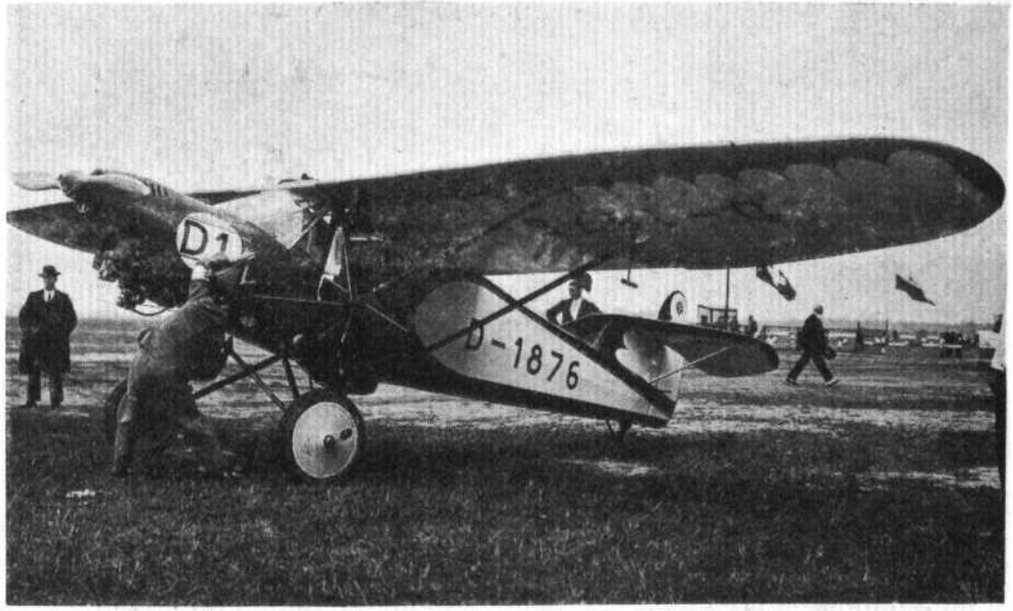
JUNKERS " JUNIOR " : This machine, photographed at the moment of starting from Berlin, is fitted with a Siemens engine. Others of the same type have the Armstrong-Siddeley " Genet."



ONE OF THE BFW MONOPLANES : This particular machine is fitted with a Siemens engine, although according to the original list its racing number corresponds to an Argus.



THE DARMSTADT CANTILEVER BIPLANE : Fitted with an Armstrong-Siddeley " Genet " engine, this machine is very carefully streamlined. The view from the Cabin does not appear too good.

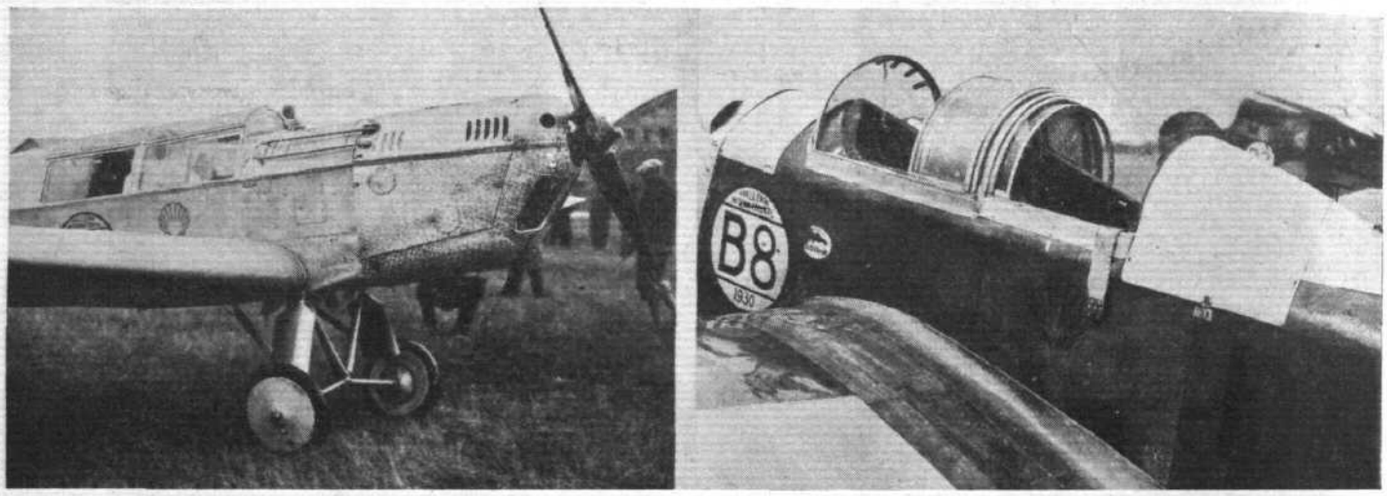


THE ARADO MONOPLANE : A German Machine, the first to be fitted with the new inverted Argus engine. Note the large streamline casings around the shock absorbers.



SOME OF POLAND'S REPRESENTATIVES ON THE STARTING LINE: The first three machines are of the RWD 4 type, and are fitted with "Hermes" engines.

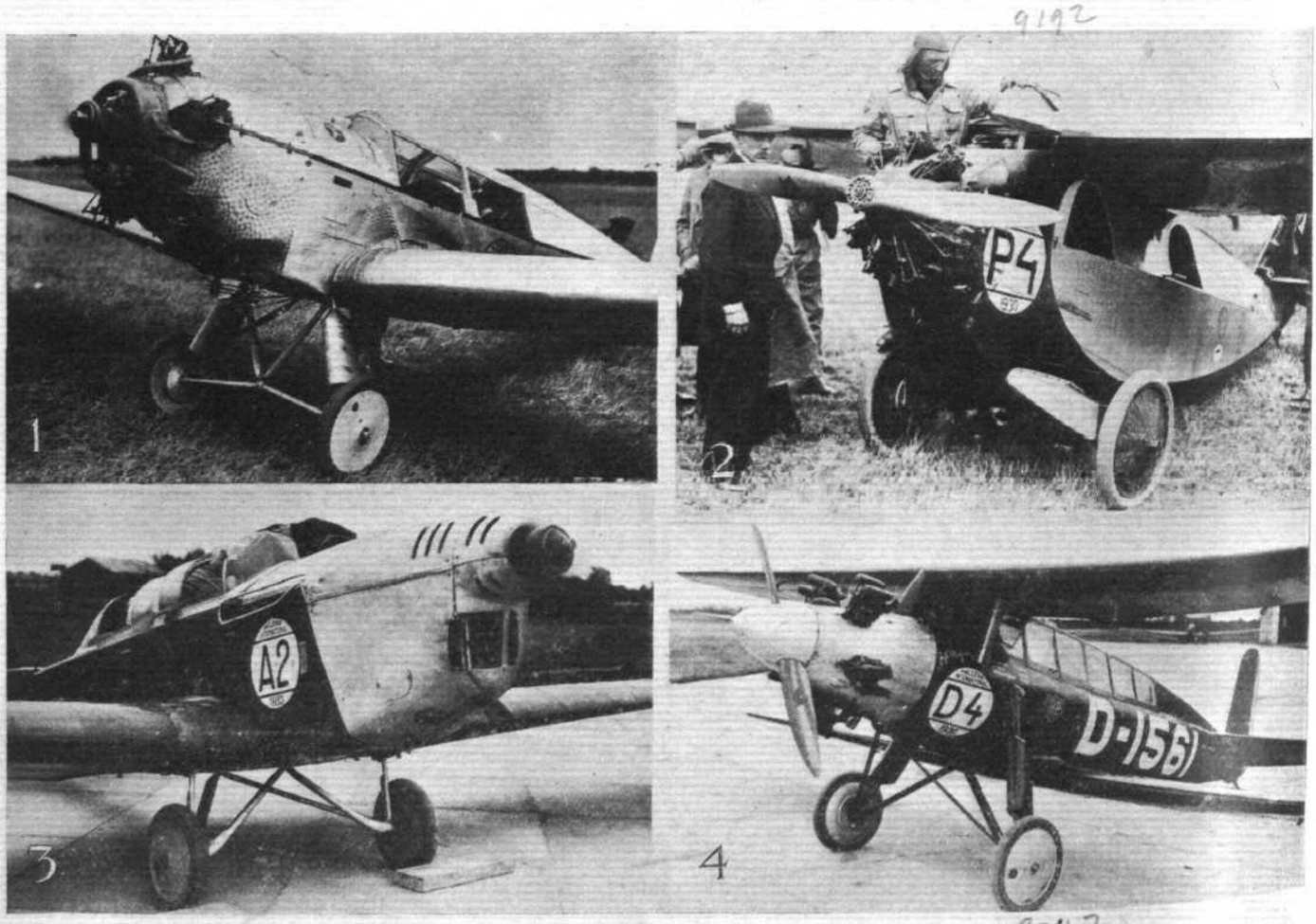
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TWO STYLES IN COUPÉ TOPS: On the left, one of the BFW Machines, and on the right one of the Klemms. The cabin roof of the Klemm telescopes, the panels being celluloid covered. (FLIGHT *Photos.*)

9192

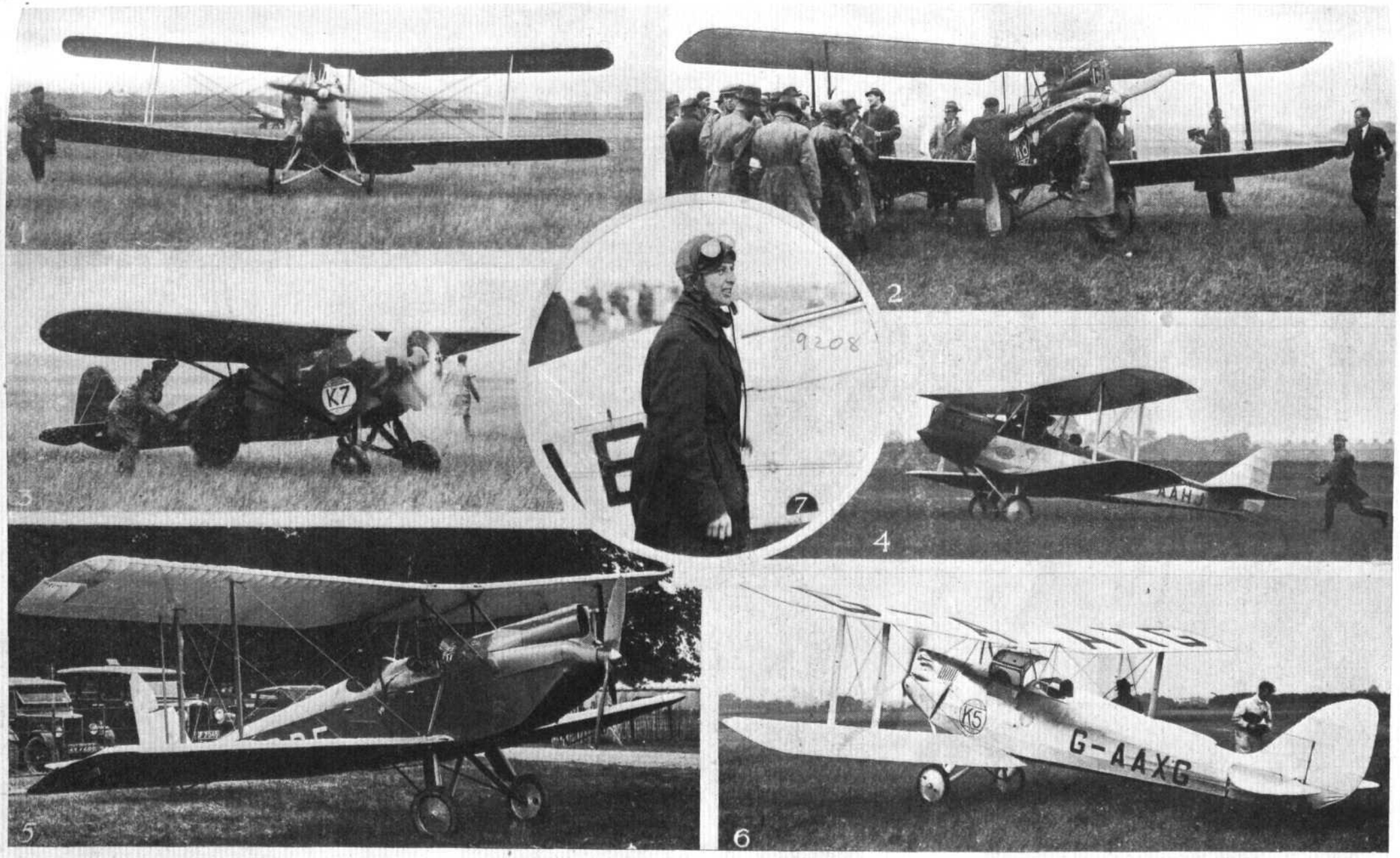
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SOME "RUNDFLUG NOSES": 1, a BFW M.23 with Siemens-Halske engine. Note Coupé Top. 2, a Polish R.W.D.2 with 40 h.p. Salmson engine. The cockpits are roofed in, but with side openings. 3, a Klemm with inverted Argus engine. The cockpit roof telescopes. 4, The Darmstadt cantilever biplane also has a conservatory roof. Note the pointed nose over the Armstrong-Siddeley Genet-Major engine. (FLIGHT *Photos.*)

9212



THE BRITISH REPRESENTATIVES: So far all the British Competitors have been doing well in the Circuit of Europe. Here they are shown during their stay at Heston. 1, Captain Broad arriving (Gipsy Moth). 2, Miss Spooner has her log book signed (Gipsy Moth). 3, Mr. Carberry in the Monospecial. 4, Mr. Thorn slows down (Hermes-Avian). 5, The Spartan Arrow. 6, Mr. A. S. Butler away again (Gipsy Moth). 7, Lady Bailey (Gipsy Moth). (FLIGHT *Photos.*)

9186



BRITISH INFLUENCE: This Polish biplane, flown by B. Orlinski, has a strong resemblance to British light 'planes, and is moreover, fitted with a De Havilland Gipsy engine. (FLIGHT *Photo.*)

9187



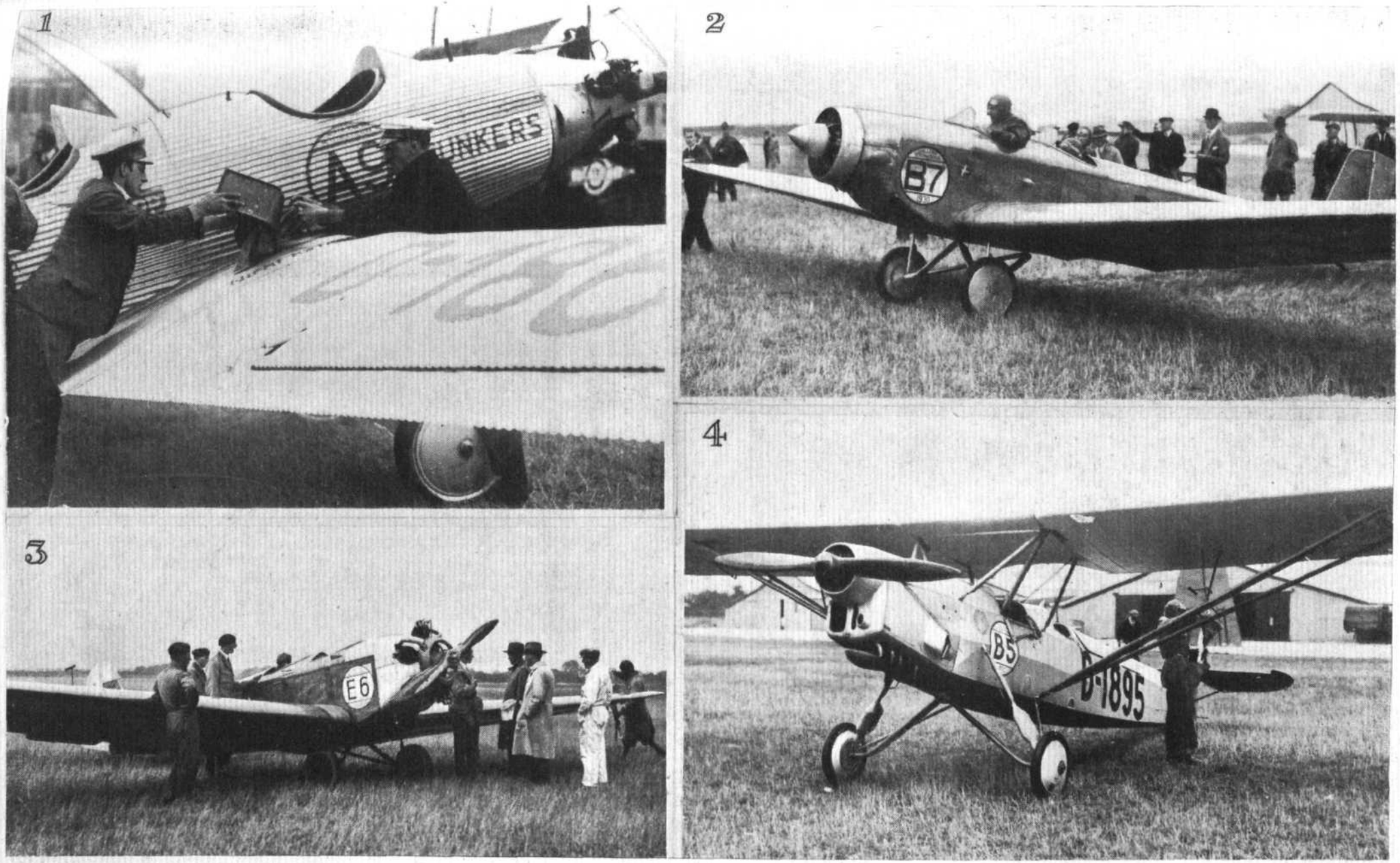
AT HESTON

TWO MONOPLANES WITH WALTER ENGINES: On the left, the Breda 15 entered by Broccard and Pierroz, and piloted by Pierroz. This machine is a Swiss entry. Below, the St. Hubert Monoplane, a Belgian Machine, but entered with the French competitors. (FLIGHT *Photos.*)

9185



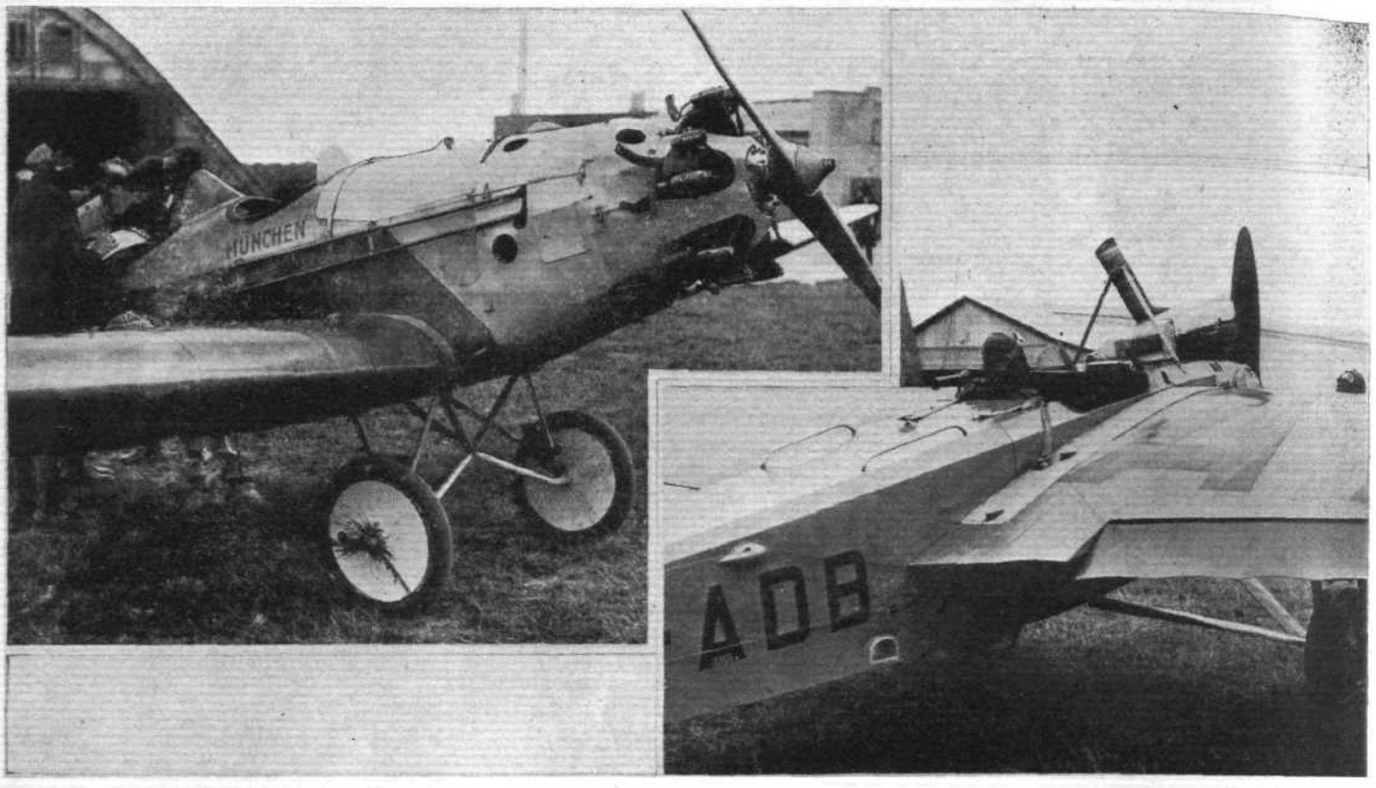
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SEEN AT HESTON: FOUR GERMAN MONOPLANES TAKING PART IN THE COMPETITION: 1, a Junkers "Junior" refuelling. 2, a Klemm with Salmson engine with Townend fitted Ring. 3, An "unfaked" Klemm with Siemens engine. 4, The Albatros L.101 parasol monoplane with inverted Argus engine. (FLIGHT *Photos.*)



LOW-WING AND MIDDLE-WING MONOPLANES: On the left, a BFW with BMW X radial engine. On the right, a Polish side-by-side monoplane, with Cirrus III engine. (FLIGHT *Photos.*)

MAJOR STENSON COOKE

Twenty-Five Years Secretary to the "A.A."

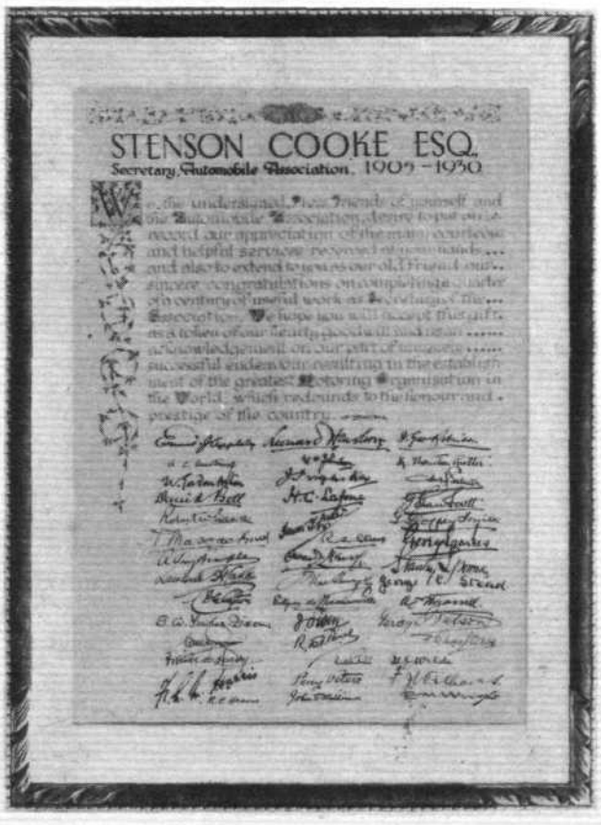
AT a luncheon following the twenty-fifth annual general meeting of the Automobile Association, on July 16, a presentation was made to Mr. Stenson Cooke, to mark the occasion of his completing twenty-five years as secretary of the association. The memento took the form of a portrait of Mrs. Stenson Cooke, with an address signed by nearly fifty representatives of the motoring press, recording their appreciation of many courteous and helpful services received, and extending to Mr. Stenson Cooke sincere congratulations on completing a quarter of a century of useful work, and of successful endeavour resulting in the establishment of the greatest motoring organisation in the world.

When "the motorists' friend" took office in 1905 there were 100 members of the "A.A." and less than a dozen patrols on the Brighton Road. There are now over 420,000 members, and there are patrols over the main and subsidiary highways of England, Wales, Scotland and Ireland.

It is generaly agreed that this success is mainly due to the energy, tact, imagination and power of organisation of Maj. Stenson Cooke. We need not here refer to the many aids and facilities the "A.A." has afforded motorists, while our readers should not have to be reminded of the useful work recently taken up in the field of aviation. The aerodrome facilities and assistance rendered by the "A.A." at various aviation meetings have been, and are, much appreciated, and the "A.A." air route maps, aerial tours, etc., are further "aids to the aviator." Our readers will, we feel sure, join us in adding our own congratulations to "the motorists' (and airmen's) Friend."

Maj. Stenson Cooke.





Mrs. Stenson Cooke.





AIR TRANSPORT

THE GROWTH OF AIR TRANSPORT

Illuminating Statistics from All Parts of the World

THE increase in the amount of air-borne mail carried from Great Britain during the quarter ended June 30, 1930 (*i.e.*, the first three months of the summer flying season), is given in an announcement just issued by the Postmaster General, which states that 22,277 lb. of letter air mail were carried as compared with 16,370 lb. during the corresponding period of 1929—or an increase of 36 per cent. The largest carryings to any one country were to India, for which the corresponding figures were 4,937 lb. in the June quarter of 1929, and 8,506 lb. in the June quarter of 1930, or an increase of 72 per cent. The traffic was divided as follows :—

	June Quarter, 1929 lbs.	June Quarter, 1930 lbs.
Indian Air Service (including Egypt, Palestine, etc.)	10,064	12,162
Australian Internal Service	299	1,152
South African Internal Service ..	No service	1,269
Other Extra-European destinations..	1,005	1,193
Continental Air Services	5,002	6,501
Total all Services	16,370	22,277

It is interesting to note that in the June quarter of 1929, less than one-third of the total letter mail carried was for Empire destinations, whereas in the quarter ending June, 1930, the figure had risen to nearly one-half of the total.

In addition, 43,263 lb. of parcel air mail were carried to various European destinations, as compared with 31,723 lb. during the quarter ending June 30, 1929, representing an increase of 36 per cent.

The total weight of air mail, letters and parcels, carried from this country during the June quarter of this year was 29 tons, as compared with 21½ tons in the corresponding quarter of 1929.

Since November, 1929, the air fees payable on letters sent by the Indian Air Service have been reduced, and on June 2, 1930, a uniform combined rate covering air fee and postage (4*d.* for the first ounce and 3*d.* for each subsequent ounce) was introduced for all European destinations. It is hoped that these reductions and the provision of the new blue Air Mail Posting Boxes in London will induce the public to make even greater use of the Air Mail than hitherto.

Further statistics concerning the world's business air travel generally have been compiled by the League of Nations Transit and Communications Section in its study of civil aviation, and we think the following information regarding these from the Geneva Correspondent of the *Manchester Guardian* (published in our contemporary on July 19) are of particular interest.

Commercial aeroplanes, he says, during 1929 flew a distance equalling 1,650 times around the world, or 41,250,000 miles. This mileage was made by commercial aeroplanes of Great Britain, the United States, Germany, France, Italy, Holland and Russia alone. More than 600,000 passengers were carried during the year, with an average of 145,000 passengers carried a distance equal to 625 miles.

An interesting fact developed is that only three or four airways are operated at a profit. The best-paying company operates over airways in Colombia, but it charges rates four to eight times greater than European lines. This company, the Sociedad Colombo-Alemana de Transportes Aereos, carries more mail, in a country with 6,500,000 inhabitants, than all the air lines in Germany. Its success is based upon the fact that it covers in one hour by air a distance that takes two days by boat and rail, and another route which is travelled by air in eight hours takes normally eight days. The Junkers'-Luftverkehr, of Persia, has operated for three years without subsidy, while the Lloyd Aereo, of Bolivia, and a New Guinea line are said to be paying expenses.

The most economically sound air service in Europe is operated out of Holland, the Netherlands K.L.M. Company, which receives a subsidy of only three francs per kilometre-ton. British lines receive the highest subsidies, around 20 francs on European airways and 90 to 100 francs on Empire air routes. The French subsidies average 17 francs ; the German 14 francs ; the Italian, 12 francs ; and the Unites States lines about 11 francs.

An interesting comparison is drawn in the amounts of money expended in the United States and European countries on aviation fields. In the United States, where there are 1,500 commercial airports, 333,000,000 dollars was spent in their upkeep and establishment during the last eighteen months. France, the most air-minded country on the Continent, has spent about five million dollars in the past ten years on her air fields. All told, there are only between 600 and 700 commercial air fields in Europe.

In comparison with railway trains, air travel is 100 times more dangerous, so the League's statisticians calculate. Automobiles are sixteen times safer. Based upon five-year statistics, one passenger is killed for every 2,551,035 miles flown in Germany, one for every 2,441,405 in the United States, and one for every 2,331,815 miles flown in Great Britain. The calculations are made on the basis of " passenger-miles "—that is, transportation of one passenger over one mile as the unit.

In the United States there are now more than 10,000 privately-owned aeroplanes, one for each 11,000 people, as compared with 26,000,000 automobiles, or one for every four people. The European coefficient is from eight to ten times smaller.

While there are 787,125 miles of railways in the world, there are now about 136,875 miles of established air routes. Last year 2,000 commercial aeroplanes were in operation, and more than 14,000 tons of merchandise and postal matter were transported.

Although Paris-London lines averaged 130 passengers per day, and some days carried as high as 500 passengers, most of the air lines dropped far below capacity in passengers, despite the fact that rates were usually less than one-fourth of actual carrying expense. The German lines (Luft Hansa) utilised only 35 per cent. of their passenger capacity, while one-half of the permanent and seasonal routes of Germany ran at 20 per cent. capacity in passengers. Seven-eighths of the tonnage transported was passengers.

As for regularity of schedules, calculated on the basis that 100 per cent. delay was permissible, British air lines had the best record. Their record was 92 per cent. ; American planes, flew up to 89 per cent. of their schedules, the German lines to 90 per cent. French short lines scored 94·2 per cent., but their longer airways, Paris-Berlin and Paris-Constantinople, fell to 87·65 per cent.

CIVIL AVIATION IN PORTUGAL

IN the report on the " Economic Conditions in Portugal " just issued by the Department of Overseas Trade, the following statement appears regarding aviation :—

" It has been realised for several years in aviation circles that the Iberian Peninsula is a natural stage in any air line that may be established between Europe and the countries bordering the South Atlantic. But up to the present no such line has materialised. In fact, 1929 has seen the suspension of the only inter-country air service as yet operative over Portugal. In June the Serviço Aereos Portugueses announced that their Junkers aeroplanes flying twice a week between Madrid and Lisbon were not carrying enough passengers to make the line pay, and the service was forthwith discontinued. For more than two years it had been operated satisfactorily and relatively cheaply. The discontinuance seems merely due to lack of advertisement or to a general

apathy and absence of airmindedness on the part of those business men who might have used it.

The Portuguese Government is interested in the possibility of using the Azores, Madeira and the Cape Verde Islands as stages on an air route to South America, and in January, 1929, a national air council was established for the consideration of general air policy. A few months later military and naval aviation commissions were set up. Shortly after its formation a concrete proposal was submitted to the air council by the Serviços Aereos Portugueses, who asked for a concession of 18 years' duration to fly regular mail services between Portugal and the Azores. The proposal was rejected. Later two French companies, the Société des Moteurs Gnome et Rhone and the Compagnie Générale Aero-Postale came to an agreement and formed a combination known as the Sociedade Portuguesa d'Estudos e Linhas Aereas, Limitada, or S.P.E.L.A., as it is styled, with an office in Lisbon. It was announced in the local press that the purpose of the company was to obtain from the Portuguese Government a concession to operate a commercial airway from Portugal via Madeira, down the west coast of Africa to the Portuguese colonies. The proposals submitted by Spela were eventually accepted in December, 1929. The concession is to run for 35 years, being thereafter renewable for periods of five years at a time. The company is to be Portuguese with headquarters in Lisbon, and the majority of the personnel must be Portuguese citizens; a regular air service must be maintained from Portugal, via the Azores, to Angola, and across to Mozambique.

The question of aerodromes has also been occupying the attention of the Portuguese Government. Those already in existence are few in number and poor in quality. The best is at Alverca, a good level space measuring 800 metres by 500 metres, 14 miles north-east of Lisbon on the right bank of the Tagus. In the north of Portugal a single hangar has been erected by the Aveiro lagoon, 25 miles south of Oporto. During the summer of 1929 arrangements were made for two Portuguese flying instructors to proceed to England for the purpose of special training. About the same time a well-known British firm secured a contract for the supply of aviation material to the Portuguese naval air service.

AIR TRANSPORT AND THE LEAGUE OF NATIONS

Air Transport Co-operation Committee's Report

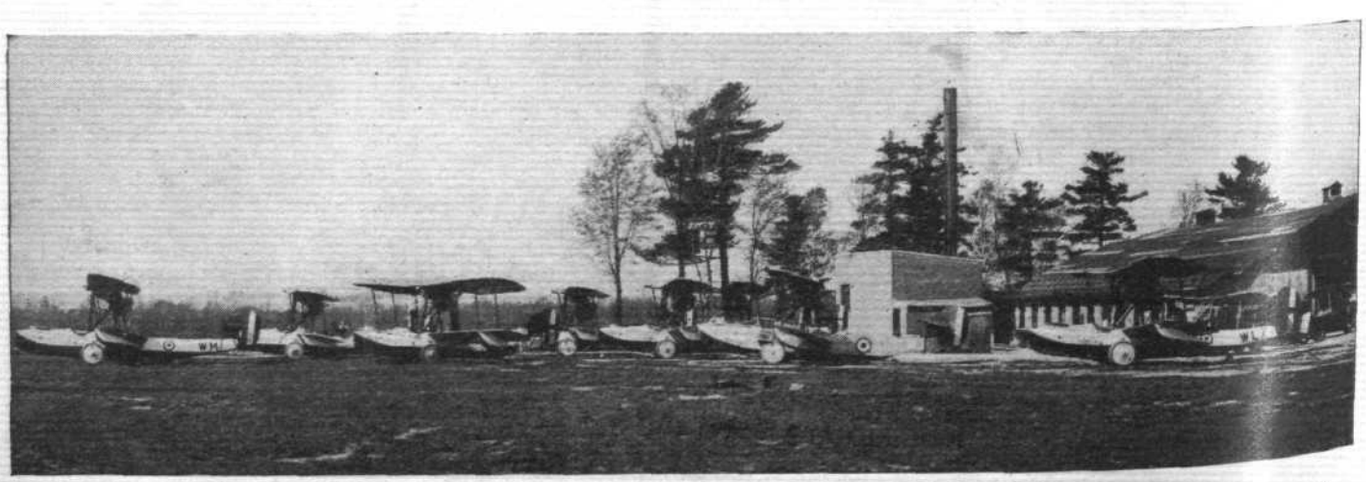
THE following is a summary of the report of the Air Transport Co-operation Committee convoked by the Advisory and Technical Committee for Communications and Transit of the League of Nations. The first session of this committee was held at Geneva from July 8 to 12, 1930. Great Britain was represented by Sir Sefton Brancker.

The committee first felt called upon to record its view that the present situation of civil aviation, despite the progress achieved, is not as satisfactory as the state of technical development should permit, and that it is only by means of increasingly close international co-operation that this situation can be improved. The committee regarded as particularly desirable the application of public international law in regard to air navigation in the greatest possible number of countries. It considered that some means of better co-ordinating the work of the various organizations dealing with air navigation should be devised. It resolved that it is desirable that the Government should request the competent international organizations to afford greater freedom to regular international transport by air, and that the Governments should examine in the most liberal spirit requests for permission to fly over their territory on regular transport. The committee also considered that the present state of legislation in which civil aeronautics are developing makes it difficult to replace this system by a better one. It recommended the Governments and companies to improve the present system by agreements which would avoid unnecessary competition. An important resolution states that, considering that certain international air connections will be of general importance and that steps will have to be taken to ensure their permanence, the committee recommends that the League should draw the attention of the Governments to the special importance of these connections, which might justify the study of a special statute.

Considering that under existing laws there are certain difficulties, for instance, that air companies could not normally own aircraft registered in different countries, the committee asked its secretariat to report on what alterations in existing law would lead to better international co-operation, whether a better system of insurance could be applied on an international basis, and whether Customs and statistical formalities could be simplified. The committee requested that the cognate committee on Combined Transport should consider what improvements could be made by the more systematic use of combined air and other transport.

The committee considered that a definite programme of co-operation in the European area should be prepared, and decided to study the choice of permanent air routes to form the main system, an international programme for their equipment so as to permit of continual day and night flying, the selection by inter-governmental agreement of qualified enterprises, and the granting to all undertakings engaged in the traffic of the widest facilities for choosing their equipment provided that this complied with the requirements. The committee was also of opinion that the study of European air mails should be undertaken at once, and instructed a sub-committee to prepare a report on the subject.

The committee was also of opinion that it would be useful from time to time to supply the authorities concerned and the general public with information, as accurate as possible, regarding the economic development of air transport, and requested its secretariat to prepare a report on this subject for the next session of the committee.



"VEDETTE" AMPHIBIANS AT OTTAWA: A group of "Vedettes" built by Canadian Vickers, Ltd., of Montreal, equipped with Armstrong-Siddeley "Lynx" engines, assembled at Ottawa preparatory to commencing operations in the Northern parts of Canada.

CROYDON WEEKLY NOTES

IN most men the thought of attempting to cross the Atlantic by air would denote a restlessness of mind, a desire to escape from the boredom of the daily round. But that was apparently not the spirit in which van Dyk entered the adventure. Possibly he did not even consider it adventurous, but just a rather prolonged kind of ordinary day's work. And in that way he, together with Kingsford Smith, Saul, and Stannage succeeded where so many others have lost their lives in failure. And now, the job done and his six weeks' leave finished, we are told that he is coming back to carry on his humdrum task of ferrying fat and prosperous financiers, American tourists, and what-nots between Amsterdam and Croydon. The K.L.M. directors must be glad to have such a servant who can take on anything so difficult and carry it through in a business-like way, avoiding the publicity and romantic stuff which would turn so many other heads.

Our celebrity list this week includes Young Stribling and his father, coming from Paris on Monday, the 14th, for his big fight with Phil Scott, and Pola Negri, who booked three seats for the Silver Wing on Sunday, the 20th, outward bound. The daily papers have already told the story of how the Hon. George Beresford, Lord Decies' 15-year-old son, was brought from Paris by air so that he might be operated on for appendicitis in London. An ambulance was awaiting him at Croydon, and the operation was performed four hours after he had left Le Bourget. It is unpleasant to think how he would have fared if only the old rough-and-tumble of surface transport had been available.

The biggest private charter for some time occurred this week when Sir Charles Hyde hired a Handley Page W-10 from Imperial Airways to take him to Belgrade. He will be away for several days.

Liverpool's new civic aerodrome at Speke is being well used by the Imperial Airways inland service, which is working to capacity. They are organising a pleasure cruise for Bank Holiday week end. An Argosy will leave Croydon at 7.45 on Monday, August 4, and proceed via Birmingham and Manchester to Liverpool, where it will, we hope, make good profits out of joy-riders and win over many potential customers. It will return next morning at 7 a.m.

The afternoon tea flights in an Argosy over London are proving more popular than ever, and are always fully booked up.

We had a surprising visitor on Thursday when the new Junkers G-31 came in on the Deutche Luft Hansa service. She is a large and excellently-equipped machine, in which the passengers sit three abreast and have the use of a complete buffet.

The Air Union begins its newspaper service to Le Touquet this week. Machines will run from both Paris and London to Berck carrying respectively French and English "dailies." Their passenger list this week has five members of the Chambre des Deputés coming to London for the International Parliamentary Conference. Amongst them were M. Renaudel and Maj. Weiller, who is the proprietor of the great air transport company, C.I.D.N.A. and of the French "Jupiter" firm. Another responsible passenger was the Director of Portuguese Aviation.

Col. Henderson's tragic death has caught us too suddenly for me to find appropriate words with which to honour this very gallant gentleman. He was held in the greatest respect both for his personal and professional qualities, and many of us must be thankful for his friendly advice when we went to him in difficulties which only his tremendous experience could solve. C. D. Shearing (who was also killed), although comparatively a newcomer to Croydon, will be mourned by many friends, for his cheery good nature won the hearts of not a few of us here.

The Robinson Aircraft Company continues to go ahead, and Mr. Robinson has now left Imperial Airways to devote himself entirely to the development of the "Redwing." Undoubtedly the aircraft industry is growing fast—faster, indeed, than at any time since the war—and it is interesting to see all the new types which are being produced—high-wing and low-wing monoplanes; single-, double-, and three-seaters, open cockpit and cabin machines. Let us see and try them all. The activity shows the interest which is being built up in aviation, and is some measure of the new money which is being invested in it. Only so can we maintain the lead which we hold at present. England heads the world in the value of aircraft exported to other countries, but America is not far behind, and may easily pass us if we relax. According to the Report on Civil Aviation for 1929, just published, our export trade in that year was valued at £2,158,667, with America second at £1,840,477.

The number of passengers during this last week has risen to 1,830, and freight mounted to 81½ tons.

There has been something missing from Croydon this last week. After carving through the depression we found that the sunny radiance of Capt. "Bill" Lawford's cheery face was no longer shining down on us from the control tower. He has gone into the west country for a fortnight's rest and peace, but we look forward to his return to drive away the rain! "M. L."

SIX KILLED IN A JUNKERS CRASH

THE most deplorable, and the most mysterious air accident which has taken place in this country for many years occurred on Monday, July 21, when a Junkers W 33, with Junkers' engine, broke to pieces in the air, over Meopham, in Kent, and the two pilots and four passengers were all killed. The disaster caused the greater consternation because all the victims were well-known people. Their names are:—The Marquis of Dufferin and Ava, Viscountess Ednam, Sir Edward Ward, Mrs. Hendrik Loeffler, Lieut.-Col. G. P. L. Henderson (pilot), and Mr. C. D'U. Shearing (assistant pilot). The machine, which had only come from the Junkers' works last May, belonged to Walcot Air Line, and was flying from Le Touquet to Croydon. Col. Henderson had flown the machine over from Le Touquet earlier in the day with his wife as passenger, and had then returned to bring over the party. According to the accounts of eyewitnesses and subsequent observations, the machine came out of a cloud when over Meopham, and then broke to pieces in the air. The port wing of the monoplane came adrift, and so did the engine and the *empennage*, and all fell in different places. The passengers all were thrown out of the fuselage before the machine reached the ground. The port wing came to earth over a mile away from the rest of the wreckage. Col. Henderson, who was strapped in the



The Junkers W.33 monoplane (Junkers engine) owned by Walcot Air Line, Ltd.

pilot's seat, was still alive when the first people got up to the crash, but died in a few minutes. The cause of the disaster is at present unexplained.

The Marquis of Dufferin, was the fourth son of the first Marquis, who won fame as Governor General of Canada and Viceroy of India. The eldest son was killed in the South African war, and the third son in the great war. The late Marquis was a prominent Ulster statesman, and was the first Speaker of the Senate of Northern Ireland. His son and heir was married only a few weeks ago. Lady Ednam was a sister of the present Duke of Sutherland. Sir Edward S. Ward served as a captain in the Grenadier Guards during the war. His father was Permanent Under-secretary at the War Office. Mrs. Loeffler was a well-known London hostess who had often entertained Royalty. Col. Henderson was one of the best-known civil pilots in the country; in fact, the first pilot who became well known in civil flying after the war. He was interested in many ventures, notably the school of flying at Brooklands, which bears his name. Mr. Shearing was an old Marlburian who had served in the Royal Air Force, and had done a considerable amount of flying in America.

Statement in the House

There may be good reasons why members of Parliament ask Ministers for information which every well-informed person ought to have known for years past, but such reasons are not always obvious. On Tuesday, July 22, Sir G. Penny, member for Kingston-on-Thames, asked what control the Air Ministry exercised over passenger aircraft, and requested details of the rules for examining such aircraft. Mr. Montague told him the facts which most schoolboys know, and added that he was generally satisfied that the regulations are most strictly complied with, "The remarkably few accidents which have occurred to British aircraft employed on regular air services of recent years is," said Mr. Montague, "in itself a striking testimony to this fact."

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AIRISMS FROM THE FOUR WINDS

Lost Australian Airman

THERE is still no news of Mr. Eric Hook, who with Mr. Matthews crashed in the Burma jungle during their flight to Australia. Search parties have examined the whole area within a radius of about 15 miles of the spot where he and Mr. Matthews parted, but so far without success. Very heavy weather has hampered the search parties considerably, and it is feared that Mr. Hook has been washed away by the floods and drowned.

New York–Buenos Aires Flight Fails

THE attempt by two American pilots, Enslow, Garrigan and Pied, to fly non-stop (with re-fuelling) in the monoplane *K. of Newhaven* has failed. They started on July 15, but the following afternoon the crew abandoned the 'plane near Atlanta, Georgia, and descended safely in their parachutes; the machine was completely destroyed. The airmen stated that the machine got out of control owing to the bad weather, and that they had exhausted their petrol.

Miss Amy Johnson's Return

MISS AMY JOHNSON arrived at Colombo on July 16, and was accorded a civic reception. She arrived at Bombay on July 20, where she also received an enthusiastic welcome.

The Air Ministry announces that arrangements have been made for an official reception to be given to Miss Amy Johnson, C.B.E., when she arrives at Croydon aerodrome on her return from Australia. Miss Johnson has intimated that she will travel from Egypt by the Imperial Airways aircraft, which is due to arrive at Croydon on the evening of Monday, August 4. Lord Thomson, Secretary of State for Air, hopes to be present to welcome her. Full details of the arrangements which are being made to enable the public to witness Miss Johnson's arrival will be published later. Meantime plans have already been approved for a large part of the western section of the aerodrome to be utilised as a free public enclosure. A civic reception is also being arranged when she arrives at Hull, her native town, on August 11.

A Skyscraper Mooring Mast

PLANS have been made for the erection of a mooring mast for airships on the roof of the skyscraper being built on the site of the old Waldorf-Astoria Hotel in New York. The top of the mast (on which will be an aircraft beacon) will be 1,248 ft. from street level.

Italy–Japan Flight

SIGNOR LOMBARDI, who left Italy on July 14 on a flight to Tokyo, reached the naval aerodrome at Yokosuka on July 22.

Japan and Airships

THERE are reports of a large airship transport company being formed in Japan, in conjunction with the Zeppelin Co. The new company will have a capital of 120,000,000 yen (£12,000,000), and will operate six journeys monthly between Tokyo and San Francisco. The single fare will be 1,800 yen (£180), and the journey is to take 68 hours. Future plans include a service between Japan and Europe.

Graf Zeppelin

THE German airship *Graf Zeppelin*, which has been carrying out a cruise to Spitsbergen, called at Reykjavik, Iceland, on July 17. On its return to Friedrichshafen, the airship flew over the Palatinate, on July 20, and landed at Neustadt, in connection with the liberation ceremonies being held throughout the Rhineland.

Hon. A. E. Guiness's Supermarine "Solent"

ON Friday last, the 18th, Mr. G. A. Allison flew the Hon. A. E. Guiness's Supermarine "Solent" flying boat G-AAAB from Southampton to Dun Laoghaire, Co. Dublin. The journey took rather longer than usual and occupied 5 hours 10 minutes, as strong head winds were met with during the greater part of the flight. The sea in the harbour at Dun Laoghaire was somewhat choppy on the night of the flying boat's arrival and afforded the sightseers an adequate opportunity of observing how really seaworthy this type of craft is. She remained at Dun Laoghaire over the week-end, and after re-fuelling, left with the Hon. A. E. Guiness and Mr. Allison for the owner's home at Cong, Co. Galway.

Banquet to Navigator of the "Southern Cross"

AT a meeting of the Irish Aero Club held in Dublin last week it was decided that a banquet should be held in honour of Capt. Patrick Saul, the Irish navigator of the "Southern Cross" on her Atlantic flight, when he returns to Ireland in about a fortnight's time.

Double Fatality near Maidstone

ON July 20, Miss Gladys Grace—a grand-daughter of Dr. W. G. Grace—and Lieut. S. E. Spencer were involved in a fatal aeroplane crash at Detling, near Maidstone. They had previously flown up from Hamble in Lieut. Spencer's "Moth," and it was when they were starting on the return journey that the machine crashed after a low loop, bursting into flames on striking the ground, and both occupants were unable to be extricated from the burning wreckage.

King's Cup Air Race Prizes

THE Royal Aero Club announces the following award of prizes in the King's Cup Air Race, which was held on July 5:—

The King's Cup. Presented by H.M. the King:—
Miss Winifred Brown, Avro Avian Cirrus III.

Prizes presented by Lord Wakefield of Hythe:—
First prize, £200, Miss Winifred Brown, Avro Avian Cirrus III.
Second prize, £100, Mr. A. S. Butler, D.H. Moth Gipsy II.
Third prize, £50, Mr. Robert McAlpine (pilot, Fl./Lt. H. R. D. Waghorn), Blackburn Bluebird Mark IV Gipsy I.

Fastest Time Round the Course. Bristol Evening Times Cup and £100 presented by Lord Wakefield of Hythe:—
Mr. A. S. Butler, D.H. Moth Gipsy II; speed, 129·7 m.p.h.

Handicap on Formula. £50 presented by Lord Wakefield of Hythe:—
Mr. A. S. Butler, D.H. Moth Gipsy II.

Best Handicap Time between London and Newcastle-on-Tyne:—
First prize, *Evening World* Newcastle-on-Tyne Challenge Trophy and £60, Miss Winifred Brown, Avro Avian Cirrus III.
Second prize, £30, Mr. A. S. Butler, D.H. Moth Gipsy II.
Third prize, £10, Mr. Robert McAlpine (pilot, Fl./Lt. H. R. D. Waghorn), Blackburn Bluebird Mark IV Gipsy I.

Best Handicap Time between London and Hull. Prizes presented by Hull Oil Manufacturing Co., Ltd., Hull, 25 guineas; Premier Oil Extracting Mills, Ltd., Hull, 25 guineas;
Miss Winifred Brown, Avro Avian Cirrus III.

Siddeley Challenge Trophy. Presented by Mr. J. D. Siddeley, and £50. Presented by Mr. M. H. Volk:—
Miss Winifred Brown, Avro Avian Cirrus III.

THE ROYAL AIR FORCE

London Gazette, July 15, 1930.

General Duties Branch

Pilot Officer on probation D. H. V. Craig is confirmed in rank; June 26. The following Pilot Officers are promoted to rank of Flying Officer:—F. L. P. Henzell, R. C. Jonas; June 15. E. Esmonde, A. E. V. Mathias, A. T. Orchard; June 28. Pilot Officer W. D. Butler is promoted to rank of Flying Officer; Jan. 30, 1929. (Substituted for *Gazette*, June 21, 1929.) Sqdn.-Ldr. J. S. T. Fall, D.S.C., A.F.C., remains on half-pay, scale B; Aug. 1 to Sept. 29 inclusive.

The following are placed on the retired list:—Sqdn.-Ldr. A. G. Weir; July 11. Flt.-Lieut. R. W. Edwards; July 15. The following relinquish their short-service commns. on completion of service:—Flt.-Lieut. C. W. Croxford, D.S.C., Flying Officer (Hon. Flt.-Lieut.) G. Anderson; July 14. Lt.-Cdr. R. C. Allen, R.N., Flying Officer, R.A.F., ceases to be attached to R.A.F. on return to Naval duty; July 1.

Stores Branch

Flying Officer W. H. Bowden is placed on retired list; July 15.

Medical Branch

Sqdn.-Ldr. H. J. Procter, L.D.S. (Major, Army Dental Corps), relinquishes his temporary commn. on return to Army duty; July 2.

ROYAL AIR FORCE INTELLIGENCE

Appointments—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Group Captain A. H. Jackson, to H.Q., Coastal Area; 15.7.30.

Squadron Leaders: H. G. White, to R.A.F. College, Cranwell; 1.7.30. R. B. Munday, D.S.C., A.F.C., to H.Q., Coastal Area, 8.5.30.

Flight Lieutenants: S. Graham, M.C., to School of Tech. Training (Men), Manston; 1.7.30. M. W. C. Ridgway, to R.A.F. Base, Calshot; 1.7.30. D. C. Prance, to No. 209 Sqdn., Mount Batten; 1.7.30. F. Boston, to No. 1 Sch. of Tech. Training (Apprentices), Halton; 1.7.30. F. C. Rowland, to Station H.Q., Andover; 1.7.30. E. E. Fallick, to No. 1 Sch. of Tech. Training (Apprentices), Halton; 1.7.30. H. I. Cozens, to Sch. of Photography, S. Farnborough; 3.7.30. C. W. Croxford, to R.A.F. Depot, Uxbridge; 11.7.30. C. J. Collingwood, to H.Q., Wessex Bombing Area, Andover; 7.7.30. R. J. A. Ford, to No. 15 Sqdn., Martlesham Heath; 6.7.30. J. E. W. Bowles, to No. 33 Sqdn., Eastchurch; 11.7.30. D. V. Carnegie, A.F.C., to R.A.F. Base, Calshot; 17.7.30. V. H. Clift, to R.A.F. Base, Calshot; 13.7.30. J. G. D. Armour, to No. 24 Sqdn., Northolt; 15.5.30. C. C. Bazell, to H.M.S. *Courageous*; 16.7.30. F. H. Whitmore, M.B.E., D.S.C., to H.M.S. *Courageous*; 16.7.30.

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THE ROYAL AIR FORCE

Vacancies for Apprentice Clerks.

VACANCIES exist in the Royal Air Force for well-educated boys, between the ages of 15½ and 17, to enter as apprentice clerks this month, in October, and in January next. The appointments will be made partly by the direct entry of boys who have obtained an approved school certificate, and partly by means of an open competition which will be held by the Civil Service Commission in October at various centres.

Detailed information regarding the apprentice clerk scheme can be obtaned from the Royal Air Force (Apprentice Clerks' Department), Gwydyr House, Whitehall, S.W.1. Successful candidates will be required to complete, in addition to the training period, 12 years' Regular Air Force service after reaching the age of 18. At the age of 30 they may return to civil life or may be permitted to re-engage to complete time for pension.

Boys entered under this scheme undergo a two years' course of training in clerical duties, typewriting, shorthand, book-keeping and practical office routine, during which time their general education is continued under a staff of graduate teachers.

The apprentice clerks are paid 1*s.* a day for the first year and 1*s.* 6*d.* a day afterwards. The subsequent *commencing* rates of pay, varying from 3*s.* to 4*s.* 6*d.* a day (21*s.* to 31*s.* 6*d.* a week), depend upon the degree of success they achieve at their final examination. In addition, they receive free board and lodging and a uniform allowance.

Vacancies for Royal Air Force Apprentices

FIVE HUNDRED aircraft apprentices, between the ages of 15 and 17, are required by the Royal Air Force for entry into the Schools of Technical Training at Halton, Bucks, and at Cranwell, near Sleaford, Lincs. They will be enlisted as the result of an Open Competition and of a Limited Competition which will be held in the near future by the Civil Service Commissioners and the Air Ministry respectively. Boys in possession of an approved first school certificate may be admitted without other educational examinations. Successful candidates will be required to complete a period of twelve years' regular Air Force service from the age of 18, in addition to the training period. At the age of 30 they may return to civil life or may be permitted to re-engage to complete time for pension.

Full information regarding the dates of the respective examinations, the methods of entry and the aircraft apprentice scheme generally can be obtained upon application to the Royal Air Force (Aircraft Apprentices' Department), Gwydyr House, Whitehall, London, S.W.1. The sons of officers, warrant officers and senior N.C.O.'s of the three services will receive special consideration.

The scheme offers a good opportunity to well-educated boys of obtaining a 3-years' apprentice course of a high standard and of following an interesting technical career. Already over 6,000 aircraft apprentices have completed their training at the technical schools of the Royal Air Force, and the annual output is approximately 1,000 fully trained aircraftmen.

The principal trades open to boys are metal rigger, a new trade brought into existence by the introduction of the metal aeroplane, which involves training in both fitting and sheet metal work; fitter (aero engine); fitter (driver, petrol); fitter (armourer); coppersmith and metal worker; wireless operator-mechanic; and electrician. The apprentices are given a thorough training in their trade by highly qualified technical instructors and their general education is also carried on simultaneously by a staff of graduate teachers.

During the training period the rate of pay is 1*s.* a day for the first two years and 1*s.* 6*d.* a day thereafter until the apprentice has both attained the age of 18 and been posted to a unit on completing his training. When he is posted to a unit for duty as an aircraftman, the commencing rate of pay varies from 3*s.* 3*d.* to 5*s.* 6*d.* a day (22*s.* 9*d.* to 38*s.* 6*d.* a week), according to the marks obtained in the passing out examination. He also receives free board and lodging and a uniform allowance. Subsequently, there is the prospect of promotion, on passing certain prescribed tests.

A few apprentices of special promise proceed to the Royal Air Force College (all their fees thereat being remitted) for training with a view to becoming Commissioned Officers.

For the remainder, opportunities arise later to volunteer to qualify in flying and become airman pilots. Between 100 and 120 of the latter are selected annually from volunteers of all trades. From amongst airman pilots a few are periodically selected for commissioned rank.

Stores Officers—Royal Air Force

ABOUT five vacancies for permanent commissions in the Stores Branch of the Royal Air Force will be offered for competition among young men of between 23 and 25 years of age on January 1, 1931, who have had not less than five years' business experience in a firm of standing. This will be the fifth competition under the scheme inaugurated in 1926 for the purpose of obtaining men with a business training to control and administer the supply of the highly valuable and complex equipment of the Royal Air Force.

From among those who apply a limited number of candidates will be selected to proceed to the examination which will be held in London in the latter part of October, 1930, and will consist of two parts, an interview before a board and a written examination. The written examination will be of such a character that men of good general education can take it without special study.

Accepted candidates will be gazetted to commissions as Pilot Officers on probation and will receive six months' training in their future duties. After a year's satisfactory service they will be eligible for confirmation in their appointments and for promotion to the rank of Flying Officer. Promotion above the rank of Flying Officer will be by selection, subject to passing a qualifying examination.

The emoluments of Officers in the Stores Branch including the value of quarters, rations, and services in kind, or cash allowances in lieu range from approximately £345 a year for an unmarried Pilot Officer, and £379 a year for a Flying Officer on promotion, to £1,159 a year for a married Group Captain (the highest rank for which provision is made). The expenses in Royal Air Force messes are strictly regulated so that Officers even of the most junior rank can live upon their pay.

Application should be made to the Secretary, Air Ministry (S.7), Kingsway, London, W.C.2, for the regulations and for application forms. Completed application forms should reach the Air Ministry by August 15 next or at the latest by September 1.

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"THE COAST WATCHERS"—OBSERVER CORPS EXERCISES

THE annual exercises of the Observer Corps which forms part of the air defence organisation, take place in the latter part of this month. The exercises are held in order to give members of the Corps practical experience in spotting aircraft during flight and in passing reports to air defence headquarters.

The practices will be carried out over an area stretching from Suffolk along the coastal counties to Hampshire, and the Royal Air Force will provide the necessary aircraft to enable the Observer Corps to be exercised. In these tests the sole function of the aircraft engaged is to fly over the counties in which the Corps is established. There is no question of raids being carried out on definite objectives as in the general air exercises which will take place next month. Flying will take place mainly between the hours of 8 p.m. and 10 p.m., but there will be no flights in the immediate vicinity of London.

The members of the Observer Corps are enrolled as Special Constables, and give their services entirely voluntarily. They play an important part in the home defence organisation. For the first time, certain of the coastguard stations are, by permission of the Board of Trade, co-operating in the present exercises.

The Observer Corps owes its inception to Maj.-General E. B. Ashmore, C.B., C.M.G., M.V.O., who, during the latter part of the war controlled the air defences of London. Since 1929, however, the Observer Corps has passed under the control of the Air Force. Air Marshal Sir Edward L. Ellington, Air Officer Commanding-in-Chief, Air Defence of Great Britain, is now responsible for the training and efficiency of the Corps with the help of a retired air officer, Air Commodore E. A. D. Masterman, C.B., C.M.G., C.B.E., A.F.C.

INTERNATIONAL TOURING COMPETITION

(*Concluded from page* 841)

was heard to say as he ran towards the machine even before it hit: "Oh, we can repair that alright!"

A smaller edition of the same machine the RWD2 also arrived. This is fitted with a neatly cowled-in 40 h.p. Salmson, and has an undercarriage reminiscent of the Wee Bee. Both this and its larger sister have the fuselage hung from the cantilever wing by two fittings which are a very few inches apart, so that the wing appears to sway about on top of the fuselage in a rather terrifying manner.

Taken all round, the Polish machines seemed to show the greatest originality of anyone and were certainly very interesting in most cases. 02 a PZL 5 was a very solid looking edition of a cross between the Avian and a Moth. It had a Gipsy engine and medium thick biplane wings. 07 a PWS 51 was not at all unlike the Westland Interceptor Fighter. Its Genet engine looked much too small for such a large machine. Being a low-wing monoplane, the view must have been good and the cockpits were simply colossal.

The 06 was a PWS 50 with a Cirrus III. This was a mid-wing monoplane with the two passengers seated side-by-side between the spars. The view appeared very good and the construction sound.

O5 was a largish rigidly-braced biplane looking rather like the Gugnunc. It was a PWS 8 with a Walter 85 h.p. engine. The view of the pilot in the upward direction did not look good.

The majority of the German entries, such as Klemm's and BFW's, have been fitted with cabin tops of some kind. That on the BFW appeared neat and comfortable, having flat sides and fairly larger openings where the pilots could look out clear of the windows, but that on the Klemm was a kind of concertina arrangement of half-hoops covered in celluloid and the pilot's head just about fitted the opening when he wished to look clear of the celluloid, so what happened in rough weather one hardly likes to think.

It seems somewhat astonishing that no points were given for silence. Most of the machines had stub exhausts and that with their long thin airscrews made them very noisy indeed.

The new inverted Argus engine was used very extensively and in all cases arrived without the slightest drop of oil on the outside. It is really the cleanest engine, from that point of view, that we have seen.

A Klemm (Salmson) looked very neat with a form of Townend ring on as also did Mr. Carberry's Mono Special. The evening of Tuesday was marred by the tragic death of Herr Oertzen's passenger, Dr. von Reders, who stepped into the airscrew and was killed as he was leaving the machine.

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MODELS

THE LORD WAKEFIELD INTERNATIONAL CUP COMPETITION

THE above competition was held at Halton Aerodrome, by kind permission of Air Commodore I. M. Bonham-Carter, C.B., O.B.E., on Saturday, July 19. Three countries were represented, Great Britain, Canada and America.

Results as follows :—

Name.	Country.	Time.
1st, Ehrhardt ..	U.S.A. ..	.. 2 min. 35 sec.
2nd, W. J. Plater	Great Britain (H.M.A.S.)	.. 1 min. 23 sec.
3rd, T. Newell ..	Great Britain (T.M.A.C.)	.. 1 min. 3 sec.

Full particulars of meeting will be given in next week's "FLIGHT."

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R.A.F. SPORT

Lawn Tennis

The results of the R.A.F. Lawn Tennis Championships at Wimbledon, up to July 22, were as follow :—

Singles Championship

2nd Rd. (concld.): Sq.-Ldr. N. F. D. Buckeridge beat F/O. J. C. Cunningham, 6—3, 6—3; Flt.-Lt. N. P. Dixon beat F/O. F. G. Downing, 6—3, 6—2; F/O. J. W. Hale beat Wing-Cdr. J. C. P. Wood, 6—0, 6—2.

3rd Rd.: Wing-Cdr. R. E. Saul beat Sq.-Ldr. C. St. Noble, 6—2, 6—4; P/O. H. D. Nicholson beat Buckeridge, 6—3, 9—7; Wing-Cdr. H. J. F. Hunter (holder) beat Dixon, 6—2, 6—0; Hale beat F/O. A. W. Rule, 6—4, 6—4.

Doubles Championship

1st Rd.: Wing-Cdr. L. T. N. Gould and Air Comdre. F. V. Holt beat Flt.-Lt. N. P. Nixon and F/O. L. V. Hirst, 6—2, 6—2; Air Comdre. A. D. Warrington-Morris and Wing-Cdr. A. G. N. Bellfield beat Wing-Cdr. K. R. Park and Sq.-Ldr. T. C. Thomson, 6—1, 6—2; P/O. H. D. Nicholson and P/O. E. C. Hudleston beat P/O. D. P. Lascelles and P/O. S. H. Beil, 6—4, 6—2; Wing-Cdr. H. J. F. Hunter and Wing-Cdr. R. E. Saul (holders) beat F/O. F. G. Downing and Wing-Cdr. F. L. Robinson, 6—3, 6—2.

2nd Rd.: Sq.-Ldr. A. J. Capel and Flt.-Lt. R. H. Hanmer beat Gould and Holt, 6—2, 6—3; F/O. A. W. Rule and F/O. J. C. Cunningham beat Flt.-Lt. I. E. Brodie and Wing-Cdr. J. C. P. Wood, 6—1, 6—3.

Lady Bailey in Birmingham

AN interesting function of air interest took place in Birmingham on Friday, July 11. This was a lecture on "Civil Aviation" given by the Hon. Lady Bailey, D.B.E., who arrived at Castle Bromwich aerodrome shortly beforehand on the Imperial Airways liner "City of Washington." Lady Bailey, who was welcomed with enthusiasm by reason of her plucky aerial ventures, was introduced by Mr. P. J. Hannon, the popular M.P., for one of the Birmingham constituencies, in a happily-phrased little speech. In her remarks to the audience the lecturer herself recounted many interesting experiences on the airways (including an impromptu landing in the middle of a country pond, when—as she pointed out—there was any amount of surrounding countryside which would have served the purpose better), and stressed the need for increased public support for the many civil flying enterprises of nowadays. Lady Bailey modestly made no mention of the different noteworthy aerial feats by which her name has become almost as well-known as is that of Sir Abe Bailey, her distinguished husband, but these were referred to by later speakers—Sir Charles Grant Robertson, the Vice-Chancellor of the University of Birmingham, and Sir Charles Rafter, the Chief Constable of the City—who ultimately proposed and seconded a vote of thanks to the Lecturer for coming to Birmingham in the cause of fostering private flying.

The second part of the programme was occupied by the showing by Capt. C. D. Barnard (the pilot to the Duchess of Bedford), of lantern slides made from snapshots taken during their epoch-making flight to the Cape and back in 20 days not long ago. These were of special interest as showing what can be done by way of hand camera photography by an air pilot engaged upon an important flight. The scenes shown evinced laughter, as well as interest, particularly when the lantern operator caused one aeroplane to perform involuntary aerobatics before (at the fourth attempt) inserting the slide the right way up. Altogether, those who were not present at this particular flying function missed something.

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PUBLICATIONS RECEIVED

The Broad Skyway: A Manual of Private Flying. By M. Steuart. The "Aeroplane" Publishing Co., 175, Piccadilly, London, W.1. Price 2*s.* 6*d.* net.

Pilots' Luck. Drawings by Clayton Knight. George G. Harrap and Co., Ltd., Parker Street, Kingsway, W.C.2. Price 10*s.* 6*d.* net.

Notiziario Tecnico di Aeronautica. Vol. VI. No. 5. *May,* 1930. Ministero dell'Aeronautica. Instituto Poligrafico dello Stato, Rome. Price L.10.

Stunt Flying. By Capt. R. Duncan. London: Crosby Lockwood & Son. Price 7*s.* 6*d.* net.

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AERONAUTICAL PATENT SPECIFICATIONS

(*Abbreviations*: Cyl. = cylinder; i.c. = internal combustion; m. = motors. The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

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